REPORT

Better Medicine for Children

"Survey Of The Availability And Prices of Children's Medicine In Chhattisgarh State, India"

Conducted by

State Health Resource Centre, Raipur, Chhattisgarh

World Health Organization, New Delhi

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Acknowledgments

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Sincere thanks also to the colleagues of SHRC, Raipur, for their continuous support in times of need.

Abbreviations

ASHA	Accredited Social Health Activist
CCDA	Chhattisgarh Chemists and Druggists Association
CGMSC	Chhattisgarh Medical Service Corporation
CHC	Community Health Centre
CHV	Community Health Volunteer
CHW	Community Health Worker
CIF	Clearing Insurance & Freight
CS	Civil Surgeon
CMHO	Chief Medical Health Officer
DH	District Hospital
DHS	Director of Health Services
DLHS	District Level Health Survey
EML	Essential Medicine List
FDC	Food and Drug Controller
IMNCI	Integrated Management of Neonatal and Childhood Illnesses
IMR	Infant Mortality Rate
LPG	Lowest-Priced Generic
MDG	Millennium Development Goals
MPR	Median Price Ratio
MSP	Manufacturer's Selling Price
NFHS	National Family and Health Survey
NGO	Non-Governmental Organisation
NHSRC	National Health Systems Resource Centre
NRHM	National Rural Health Mission
PHC	Primary Health Care
PHFI	Public Health Foundation of India
PIP	Project Implementation Plan
RMA	Rural Medical Assistants
SHC	Sub Health Centre
SHRC	State Health Resource Centre
SRS	Sample Registration System
STG	Standard Treatment Guideline

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Executive Summary

Background

The Better Medicines for Children (BMC) project, initiated by the World Health Organization in 2009 with funding from the Bill and Melinda Gates Foundation, aims to improve access to essential medicines for children through by addressing issues of availability, safety, efficacy and price. The project includes activities to improve availability of children's medicines in India with a special focus on Chhattisgarh and Orissa. The project seeks to directly support and address some of the major issues in millennium development goal 4 (MDG 4). Major sources of Childhood illnesses in Chhattisgarh are diarrhea, Acute Respiratory Infections including Pnuemonia, Neonatal Sepsis, Malaria, Measles,Tuberculosis and underlying Malnutrition.

In Chhattisgarh, efforts are needed to improve access to treatment for the above major causes of childhood illness. For example, only one third of the children with diarrhea receive Oral Rehydration Solution (ORS) and only two thirds receive treatment for Acute Respiratory Infection[1] (according to the District Level Household and Facility Survey DLHS-3, conducted in 2007-2008). In addition, 81% of children between the ages of 6 months to three years in the state are anaemic.[2] The child mortality rate in the state[3] is also a cause for concern especially since a majority of these deaths are preventable with appropriate and timely treatment with essential medicines.

The procurement of drugs under Public Sector is by a closed bidding process at State and district level as branded products without adequate oversight on quality assurance. There are competing influencing by pharmaceutical industry on officials procuring medicines for public sector.Though a Corporation for generic procurement of quality drugs by an electronic transparent bidding process is now set up, it is yet to start its procurement activity.

Similarly, the State Drug Testing Laboratory with good investment in infrastructure and equipments is yet to start its functioning for want of placement of qualified personnel.

Though the State had an Essential Medicine List based on a policy on Rational Drug Therapy and Standard Treatment Guidelines for Public Health institutions since year 2002, the compliance to it is not strictly enforced or monitored.

The objective of the Better Medicines for Children project in Chhattisgargh is to improve the availability and affordability of essential medicines through the development of evidence-based policies and programmes. As part of the project, a baseline assessment of the availability and price of selected important children's medicines was undertaken by the State Health Resource Centre, Raipur, an Additional technical capacity to the Department of Health and Family Welfare Government of Chhattisgarh, in collaboration with WHO- SEARO, New Delhi.

Methods

A facility-based survey of the availability, price, affordability and price components of selected children's medicines was undertaken using a standardized methodology developed by the World Health Organization and Health Action International. Data on the prices and availability of 50 paediatric medicines were collected from a sample of health facilities in the public, private and nongovernmental organization sectors. Data were also collected on government procurement prices.

For each medicine, data were collected on the highest-priced and lowest-priced product found at each facility. Medicine prices are expressed as median price ratio (MPR), which are ratios relative to the Management Sciences for Health International Reference Prices for 2009. Using the salary of the lowest-paid unskilled government worker, affordability was calculated as the number of days' wages needed to purchase medicines for standard treatments of common conditions. A price components survey was also conducted to identify the add-on costs in the supply chain that contribute to final patient prices.

Key findings

Medicine availability

The average availability of paediatric medicines was sub-optimal in all sectors. In the public sector and NGO/mission sectors average availability was only 17%. In the public sector more than half (29/50) of the study medicines were not available in any of the facilities surveyed. Of the 29 medicines not found in the public sector, several also had poor or no availability in the private sector. In retail pharmacies and other private, for-profit outlets availability was higher at 46% and 35%, respectively, but was still inadequate.

Of particular note is the fact that ferrous salt is virtually unavailable in all sectors. Antiepileptics also show poor availability, particularly in the public and non-profit sectors. Antiepileptics were virtually unavailable in public sector facilities. In private pharmacies, carbamazepine products showed moderate availability (25-50%) while other antiepileptics had low or no availability. For the treatment of itanin, it was found that ORS (1L) had reasonable availability (> 80%) in public facilities and retail pharmacies. However, zinc dispersible tablets were only available in the public sector, and even here availability was low at 29%.

Of the antibiotics studied co-trimoxazole had the highest availability, with both tablet and suspension forms available in over 80% of public facilities and retail pharmacies. Ceftriazone also showed high availability in the private sector, but was not available in the public sector. While metronidazole suspension, amoxicillin powder for suspension, procaine penicillin and benzylpenicillin injections showed moderate availability in the public sector (20-60%), several other antibiotics were not available. Of the products not available in the public sector, ceftriaxone injection, amoxicillin dispersible tablet and azithromycin syrup had moderate to reasonable availability (>60%) in the private sector, while amoxicillin + clavulanic acid suspension and dispersible tablet, azithromycin tablet, and gentamicin injection had low availability (<30%).

For antimalarials, chloroquine tablets were the only product with reasonable availability (89%) in the public sector. Other products had minimal availability (<10%) or were not found at all. In retail pharmacies availability of over 80% was observed for chloroquine tablets and suspension and sulphadoxine + pyrimethamine (SP) tablets, while SP and quinine suspensions had availability of 68%, 62%, respectively. Artemether-lumefantrine products were not available in the public or non-profit sectors, and had had low availability (<15%) in private pharmacies and other private for-profit facilities..

Public sector procurement prices

Overall, the public procurement agency is purchasing medicines at prices that are just under international reference prices (MPR = 0.96), indicating a reasonable level of purchasing efficiency. The 25th and 75th percentiles indicate a moderate amount of variation across the purchase price of individual medicines, with half of the medicines being purchased at 0.71 to 0.99 times their international reference price.

Private sector patient prices

Patients in private pharmacies are paying 1.82 and 1.32 times the international reference price, on average, to purchase highest-priced and lowest-priced products, respectively. Substantial variartion is observed across individual medicines, with one-quarter of highest-priced and lowest-priced products costing over 4.12 and 2.25 times their international reference price, respectively. In the private sector, highest-priced products cost 8.3% more, on average, than their lowest-price equivalents.

Folic acid tablets showed the highest median price ratio of all medicines in the survey (20.88). The price was the same for both highest-price and lowest-price products and did not vary by sector. Albendazole chewable tablets were the next highest-priced product. In private pharmacies and other privat for-profit outlets the highest priced product was approximately 20 times the international reference price, while the lowest priced product was 10 and 13 times higher, respectively. Even in the non-profit sector the lowest priced product was close to 10 times the international reference price. Amoxicillin dispersible tablets were consistently priced at close to 6 times the international reference price in both private pharmacies and other private, for-profit outlets. In private pharmacies amoxicillin suspension 4.6 and 4.1 times the international refernece price for the highest-priced and lowest-priced products, respectively.

Affordability of standard treatment regimens

In the private sector, the affordability of both lowest-priced and highest-priced generics was reasonable for all conditions, with standard treatment costing less than a days' wage (Table X). However, it should be noted that treatment costs refer to medicines only and do not include the additional costs of consultation and diagnostic tests. Further, many people in Chhattisgargh earn significantly less that the lowest government wage; as such even treatments which appear affordable are too costly for the poorest segments of the population. Finally, even where individual treatments appear affordable, individuals or families who need multiple medications may quickly face unmanageable drug costs.

Price components in the private sector

In the private sector, the principal contributors to the final patient price are the Manufacturer's Selling Price (MSP), wholesaler and retailer mark-ups, and value-added tax (VAT) of 5%. For originator brand and branded generic products, wholesale mark-ups ranged from 8 to 11%, retail mark-ups ranged from 17 to 25%, and the total cumulative mark-up from MSP to final price ranged from 34% to 46%. For unbranded generics, wholesale mark-ups ranged from 12-14%, retail mark-ups ranged from 298-338%, and the total cumulative mark-up ranged from 376% to 413%.For branded generics, the MSP is the largest contributor to final patient price (approximately 70%). For the unbranded generic product the MSP only

contributes about 20%, while the retail mark-up which contributes over 70% to the final patient price. No substantial difference in mark-up structure was observed between urban and rural areas, or between dosage forms (suspensions, tablets, injections or inhalers).

Conclusions

The average availability of children's medicines was poor in all sectors, with many medicines unavailable in public sector facilities. While private sector prices were generally reasonable, certain medicines cost several times more than their international reference price. Little (<10%) price variation was observed between highest-priced and lowest-priced versions of individual medicines. The determining factor in the magnitude of the supply chain charges, and particularly the retail mark-up, is whether the product is an originator brand/branded generic or an unbranded generic.

Recommendations

- There is an urgent need to make child specific essential formulations / drugs available in government outlets.
- A centralised procurement and logistics system for essential medicines for children in Chhattisgarh state is needed. Procurement practices should be transparent and should be monitored by authorities at the highest levels of the department of Health.
- The state should avoid further delays in the procurement of essential drugs and ensure distribution to end users. It should also improve drug warehousing including construction of warehouses as per approved standard design.
- There is an urgent need for training and capacity building on pharmaceutical supply management, including needs assessment, indenting and maintenance of stock at the primary care level as well as at higher levels.
- Along with generic prescribing and procurement, strict quality control and testing of drugs should be ensured. This requires the immediate activation of State Drug testing Laboratory.
- The state EML/EMLc and STGs should be disseminated to all doctors and pharmacists irrespective of whether they are in the government service or not.
- Compliance with rational drug use should be monitored, e.g. through periodic prescription analysis.

Problem Statement

Access to simple, affordable medicines could prevent or treat the conditions which cause more than 8.1 million deaths of children under five each year globally(WHO Make Medicines Child size 2011).

Children are therapeutic orphans – there is lack of appropriate clinical trials, licensed medicines, formulations, information etc.on Children's medicine. In Chhattisgarh, only one third of the children with itanin receive Oral Rehydration Solution (ORS) and only two thirds receive treatment for Acute Respiratory Infection (DLHS-3, 2007-08). High Child Mortality, preventable with appropriate and timely use of essential medicines and its non-availability as well as high price are a concern.

For focused intervention in improving access to essential medicines for children, the first step is the documentation of the availability and pricing of these medicines in public and private sectors as a benchmark.

Introduction

An estimated 9 million children worldwide die each year from preventable and treatable causes. More than half of these deaths are caused by diseases which could be treated with safe, essential, child-specific medicines: acute respiratory infections – pneumonia (17%), diarrhoeal diseases (17%), neonatal severe infections (9%), malaria (7%), and HIV/AIDS (2%).

The 'make medicines child size' is a global campaign spearheaded by the World Health Organization (WHO) launched in December 2007, to raise awareness and accelerate action to address the need for improved availability and access to safe, child-specific medicines for all children. The WHO received financial support from the Bill and Melinda Gates Foundation to facilitate projects to improve availability of children's medicines in India with an initial special focus on Chhattisgarh and Orissa. This project seeks to directly support and address some of the major issues in attaining millennium development goal 4 (MDG 4).

Child health indicators of Chhattisgarh state

Major sources of Childhood illnesses in Chhattisgarh are diarrhea, Acute Respiratory Infections including Pneumonia, Neonatal Sepsis, Malaria, Measles, Tuberculosis and underlying Malnutrition.

In Chhattisgarh, two third of the children with diarrhea do not receive Oral Rehydration Solution (ORS) and one third do not receive treatment for Acute Respiratory Infection[1] (according to the District Level Household and Facility Survey DLHS-3, conducted in 2007-2008). 81% of children between the ages of 6 months to three years in the state are anaemic.[2] The high childhood mortality rate in the state[3] is also a cause of concern especially since a majority of these deaths are preventable with appropriate and timely treatment with essential medicines.

The procurement of drugs under Public Sector in Chhattisgarh is by a closed bidding process at State and district level as branded products without adequate oversight on quality assurance. There are competitive influencing by pharmaceutical

industry on officials procuring medicines for public sector. Though a Corporation for generic procurement of quality drugs by an electronic transparent bidding process is now set up, it is yet to start its procurement activity.

Similarly, the State Drug Testing Laboratory with good investment in infrastructure and equipments is yet to start its functioning for want of placement of qualified personnel.

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Rationale of study

Why conduct the pricing and availability survey?

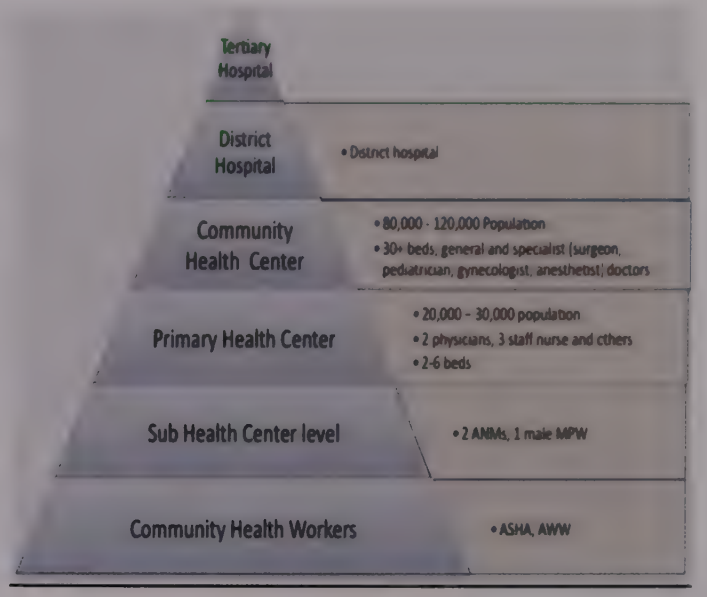
As the first step to improve access to essential medicines for children, the current availability of these medicines in public and private sectors must be documented so that focused interventions can be undertaken to improve the situation. A study conducted in five states in India has shown that essential medicines for a chronic disease such as bronchial asthma were not available in the public sector.[4] It is also known that for many patients the cost of medicines constitutes a large part of out of pocket expenses. In poor income societies, this is a major limiting factor, preventing parents from seeking treatment for their children.[5] Therefore, the prices patients pay for these children's medicines should be documented and an analysis of the components of medicine prices should be undertaken so that policy changes can be considered in order to bring down the price of medicines.

Relevance under NRHM: The planned pricing and availability survey activities in Chhattisgarh as well as the objectives of the Better Medicines for Children project fall into the broader realm of the Project Implementation Plan (PIP) of the National Rural Health Mission (NRHM) in Chhattisgarh for the years 2010-2011.[6] The project, therefore, strengthens and promotes the ongoing activities of the NRHM in the state and is in concordance with the objectives and strategies listed under section A.2.1 Integrated Management of Neonatal and Childhood Illnesses (IMNCI) and Section A.2.6 Management of Diarrhoea, ARI and Micronutrient Malnutrition.

India's Health System: An Overview

India's health system has a homogenous

large public and a still larger heterogenous private sector. The public sector consists of a hierarchy of health facilities comprising of sub-centers, primary health centers (PHC), community health centers (CHC), district hospitals and



speciality/research hospitals (see Figure.1). The private sector is largely unregulated and of multiple varieties; it comprises of super specialist hospitals, nursing homes, clinics, unqualified allopathic practitioners, trained practitioners of indigenous systems of medicine and traditional health care providers. Despite the presence of an extensive network of public sector health facilities, the majority of inpatient and outpatient care is provided by the private sector and this share has gradually increased over time. Latest estimates indicate that 80% of all ambulatory and 50% of in-patient treatment occurs in the private sector. However, the public sector continues to be the major provider of preventive healthservices. One of the unfortunate consequences of India's highly privatized health system is that, nearly 80% of the total health expenditure is paid out-of-pocket,though there is insurance covering a small percentage of the population;. For many Indians, especially those who are poor, health care payments place an enormous burden leading to people falling into poverty and debt trap, experiencing catastrophic health care payments or undertaking distress financing to pay for health services. Since health is a state subject in India's federal system, the respective state governments are responsible for administering and funding the public sector. Common norms guide the states resulting in similar public sector structures across the country. The Central government, however, is also an important financier of health care. This is primarily done through centrally sponsored schemes through which health initiatives of national importance receive direct funding from the center. Examples of these programs include, all the national disease control programs, the family planning program, the reproductive and child health program and, most recently, the National Rural Health Mission (NRHM). These programs, depending on the situation, have their own cadre of workers or fill vacancies in the public sector by hiring workers on contract or make use of the state level health workforce.

The National Rural Health Mission (NRHM), which was launched in 2005, is a key recent health system initiative, launched by the central government. It aims to bring about an 'architectural correction to the health system' through a variety of strategies, such as, substantial increases in government funding for health, integrating vertical health & family welfare programs as well as nutrition,water and sanitation programmes, providing a female health activist in each village, de-centralized health planning, communitization of health services, strengthening of rural hospitals, providing untied funds to health facilities and mainstreaming traditional medicine systems into the public health system (NRHM Mission document). It covers the entire country, with special focus on 18 states, which have relatively poor infrastructure and demographic indicators. One of the core strategies of NRHM is to integrate into the general health system the different national programs, including the disease control programs – the only exception to this is the HIV/AIDS program.

Chhattisgarh State

Chhattisgarh is one of the youngest states in India. It was carved out of the state of Madhya Pradesh in November 2000 with Raipur as the state capital. Chhattisgarh is the 10th largest state of India and is spread across an approximate area of 135,194 sq km. Nearly half of the state is forested and accounts for 12% of India's forests. Chhattisgarh shares borders with the states of Madhya Pradesh and Maharashtra in the west, Orissa in the east, Andhra Pradesh in the south, Jharkhand and Uttar Pradesh in the north. Eighteen districts make up the state (Figure 2). According to the 2001 Census, Chhattisgarh has a population of 20.7 million people and a population density of 154 persons per square kilometer compared to the national average of 324 persons per square kilometer. Chhattisgarh is a predominantly rural state with only one fifth of the population living in urban areas (Table 1). It also has a large tribal population; 30% of the population is tribal (Table 1). It is home to many of the primitive tribes of India and has a high concentration of Gonds who inhabit the hilly region of the state. Literacy levels are low, particularly for females. Remarkably, there are twice as many literate males than females (Table1).

Insurgency

Large areas of Chhattisgarh state are currently experiencing armed conflict. Seven districts (Bastar, Narayanpur, Dantewada, Bijapur, Kanker, Sarguja and Rajnandgaon) are particularly affected by violence due to the presence of left wing groups (Maoists and Naxalites). The Government is finding it difficult to implement public programs in these areas. Out of these seven districts, five are in the Bastar region in southern Chhattisgarh. These districts lack basic amenities including transportation and communication facilities, electricity, water supply and skilled human resources. Since the start of the conflict in 2006 there have been a lot of killings and social unrest in the northern and southern parts of the state. Frequently, the violence spills into other parts of the state as well.

Figure 2. Districts of Chhattisgarh

Table 1 : Social and Demographic Characteristics of Chhattisgarh

Indicator		India	Chhattisgarh
Demographic	Population(Millions)	1,028.70	20.7
	Male (%)	52	50
	Urban (%)	28	20
	Sex Ratio	933	990
Caste and Tribe	Tribal (%)	8	30
	Schedule Caste (%)	19	14
	OBC/Other	72	57
Religion	Hindu (%)	82	95
	Muslim (%)	13	3
	Christian (%)	3	1
	Sikh)	2	0.1
	Other (%)	2	0.7
Education	No education (%)	42	47
Health	Infant Mortality	57	70.8
	Stunting in Children (%)	48	53
	Children Fully Immunized	43	49
	Institutional Delivery	39	14
	Total Fertility Rate	2.68	2.62
	Life Expectancy at birth	64	58
Economy	Households with electricity (%)	68	60
	Per Capita Net state domestic product (Rs)	37,490	34,483
	Population below poverty line	28	41

Sources: NFHS (2005-06), Census (2001), SRS (2007), Economic Survey of India 2009-10

Despite all this natural wealth, Chhattisgarh is one of the poorest states in India with 41% of the population below the poverty line whereas Nationally28% of the population is below this line (Planning Commission of India 2004-05). The state's per capita income is slightly below the national average (Table 1). But, Chhattisgarh is experiencing a high economic growth rate of 16%, which is higher than the national growth rate of 12%.

Health

Chhattisgarh has some of India's worst health indicators. The infant mortality rate (70.8) in 2005 was one among the highest in India and substantially higher than the national average (57). Chhattisgarh also has one of the highest levels of child malnutrition in the country; among children under three years of age in 2005, 53% were stunted and 48% underweight (NFHS- 3). However, this has been an improvement compared to 1997, wherein the prevalence of stunting (61%) and underweight (53%) in children was substantially higher. Life expectancy at birth is also below the national average. Chhattisgarh is also a malaria endemic area; in 2006, it contributed 7% of the total malaria cases and 11% P. falciparum cases reported in the country (NVBDCP, 2007). Though full immunization coverage in Chhattisgarh is higher than the national average, 1 in 2 children are still not fully immunized. Institutional deliveries (14%) in 2005 were low and remarkably lower than the national average (Table 1).

Major sources of Childhood illnesses in Chhattisgarh are diarrhea, Acute Respiratory Infections including Pneumonia, Neonatal Sepsis, Malaria, Measles, Tuberculosis and underlying Malnutrition.

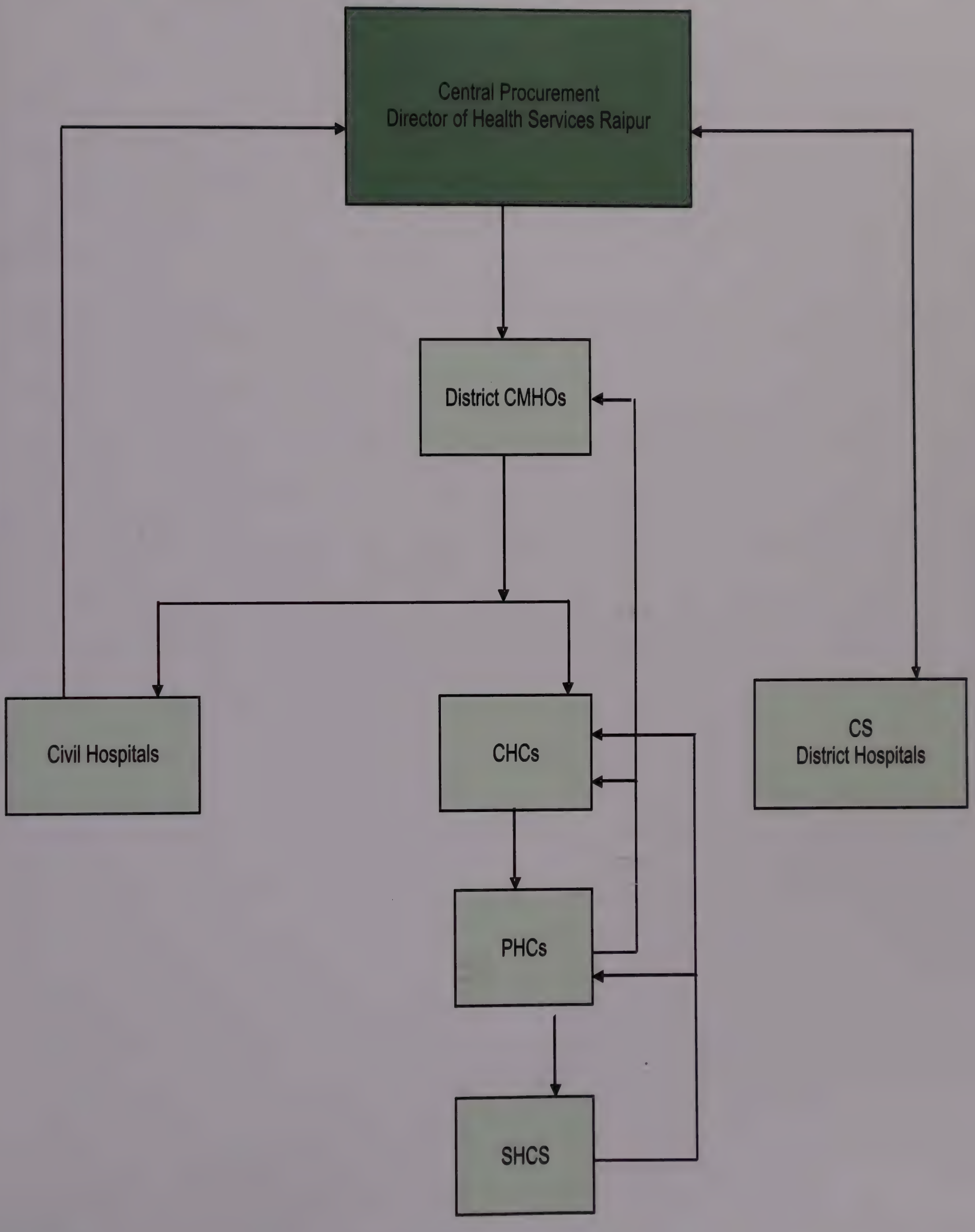
The state government has taken major initiatives to improve health services. An important initiative of the state is the deployment of 60,000 mitanins or community health volunteers (CHV) in 2002. This has been one of India's most successful CHV programs. The itanin undergo 13 rounds of training including in IMNCI and giving first level curative care. Further rounds of training are also being planned. The itanin program has influenced the design of ASHA (Accredited Social Health Activist) scheme under the National Rural Health Mission launched by Government of India. Another important human resource innovation by the state has been the introduction of a cadre of allopathic doctors with short duration of training, the Rural Medical Assistant (RMA), to serve in PHCs[7].

Figure: 3.: Procurement Structure in Chhattisgarh

Though the State had an Essential Medicine List based on a policy on Rational Drug Use and Standard Treatment Guidelines for Public Health institutions since year 2002, the compliance to it is not strictly enforced or monitored. So not only the use but also procurement list had expanded beyond the approved EML.

The procurement of drugs under Public Sector in Chhattisgarh is by a closed bidding process at State and district level as branded products without adequate oversight on quality assurance. There are competing influencing by pharmaceutical industry on officials procuring medicines for public sector. Though a Corporation for generic procurement of quality drugs by an electronic transparent bidding process is now set up, it is yet to start its procurement activity.

While procuring medicines as generic products strict vigilance on quality is a must. For this, the State Drug Testing Laboratory with good investment in infrastructure and equipments is yet to start its functioning for want of placement of qualified personnel.


Central Procurement
Director of Health Services Raipur
District CMHOs
Civil Hospitals
CHCs
CS
District Hospitals
PHCs
SHCS

Objective of The Project

The objective of the "Better Medicines for Children" project is to improve access to essential medicines for children by addressing issues of availability, safety, efficacy and price. One of the four strategic objectives of the project is to promote access to essential medicines for children in priority countries by promoting their inclusion in national essential medicines lists, treatment guidelines and procurement schemes; working with drug regulatory authorities to expedite regulatory assessment of essential medicines for children; and developing measures to monitor and manage their prices.

Objectives of the survey

The survey's objective is to generate reliable information on the price, availability and affordability of selected important children's medicines and price components in the supply chain, with the ultimate goal of improving access to affordable medicines.

The survey enables the following questions to be answered:

- ✓ What price do people pay for key paediatric medicines?
- ✓ Do the prices and availability of the same paediatric medicines vary in different sectors (public sector, private sector and other medicine outlets)?
- ✓ What is the difference in prices and availability of highest-priced and lowest-priced versions of individual medicines?
- ✓ How do local prices compare with international reference prices?
- ✓ What taxes and duties are levied on medicines and what is the level of various mark-ups that contribute to their retail and public sector prices?
- ✓ How affordable are medicines for ordinary people?

The survey was conducted using an adaptation of a standard methodology developed by WHO and Health Action International.[8] It focuses on a limited number of medicines and enables their prices and availability to be investigated across health-care sectors. The methodology facilitates rapid and reliable data collection and is easily replicable. The survey measures real paid prices, i.e. what patients pay in retail medicine outlets, and the price the government procurement agency paid. A medicine price and availability study using this methodology also enables the price of selected medicines to be followed from the point at which it leaves the manufacturer to the time it reaches the consumer's hands. The survey identifies issues related to procurement price efficiency, public and private sector availability and prices, price structure and mark-ups, and crucially, the affordability of treatments for people with lower incomes. It is a useful tool for policy-makers and others concerned about access to medicines, and serves as an important basis for more in-depth analysis of various issues that might be identified, policy considerations and interventions.

Survey period

The main survey was conducted during the month of October and November 2010. The price component survey was undertaken in Jan-Feb 2011.

Methodology

Design: The present study is a cross sectional study. The availability and unit cost (cost per tablet, mililitre, etc.) of 50 children's medicines was surveyed by trained teams in a sample of public and private sector facilities.

Setting: The study was conducted at the sub-national level in Chhattisgarh state of India. The study is facility based and includes public sector facilities (e.g. district hospitals, primary health centres), retail pharmacies (chemist shops), private clinics, nursing homes, dispensing doctors and non-governmental organization (NGOs)/mission-run health facilities, distributed in six geographical sites (districts) in the state.

Study population: The WHO – Health Action International standard methodology for pricing and availability was used for the survey[9]. A total of approximately 160 outlets were randomly sampled among 28 types of medical dispensing sites.

Geographical Areas from where data were collected:

As per the WHO/HAI methodology, six geographical areas were selected for data collection. These six regions (districts) are as follows:

Six Districts of Chhattisgarh

- Ambikapur – (Northern Region)
- Jagdalpur – Medical College (Southern Region)
- Raigarh – (Eastern Region)
- Rajnandgaon – (Western Region)
- Raipur – Medical College (Central Region)
- Bilaspur – Medical College (Central Region

Sampling

Random sampling methodology was used for selecting the sectors/outlets for data collection. Under these selected regions (districts) the following sectors as specified were randomly selected for data collection with the exception that District Hospitals and where ever Medical colleges are present then they are included as part of the sample and where ever Medical colleges are not in existence then in lieu of that a CHC/PHC is included to fulfill the sample target.

Data collection from the following sectors:

1. Procurement data : Directorate of Health Services DHS (Central, Raipur)
2. Wherever there exists district medical stores, then data were collected from them in each of the 6 districts survey was conducted.

Table 2. Sectors surveyed in each geographical area

Procurement Data	Public sector (N=14)	Private Sector (N=10)	Others (N=4)
DHS	(Raipur)	Medical College hospital (if present) – 1	Retail pharmacies (chemist shops) - 10 Private for-profit: P rivate clinics / nursing homes / dispensing doctors – 2
	District hospital – 1		Private non-profit: Health facilities run by NGOs / Mission sector – 2
	Community Health Centres – 6		
	Primary Health Centres – 6		

Figure 4.: Sampling Design:

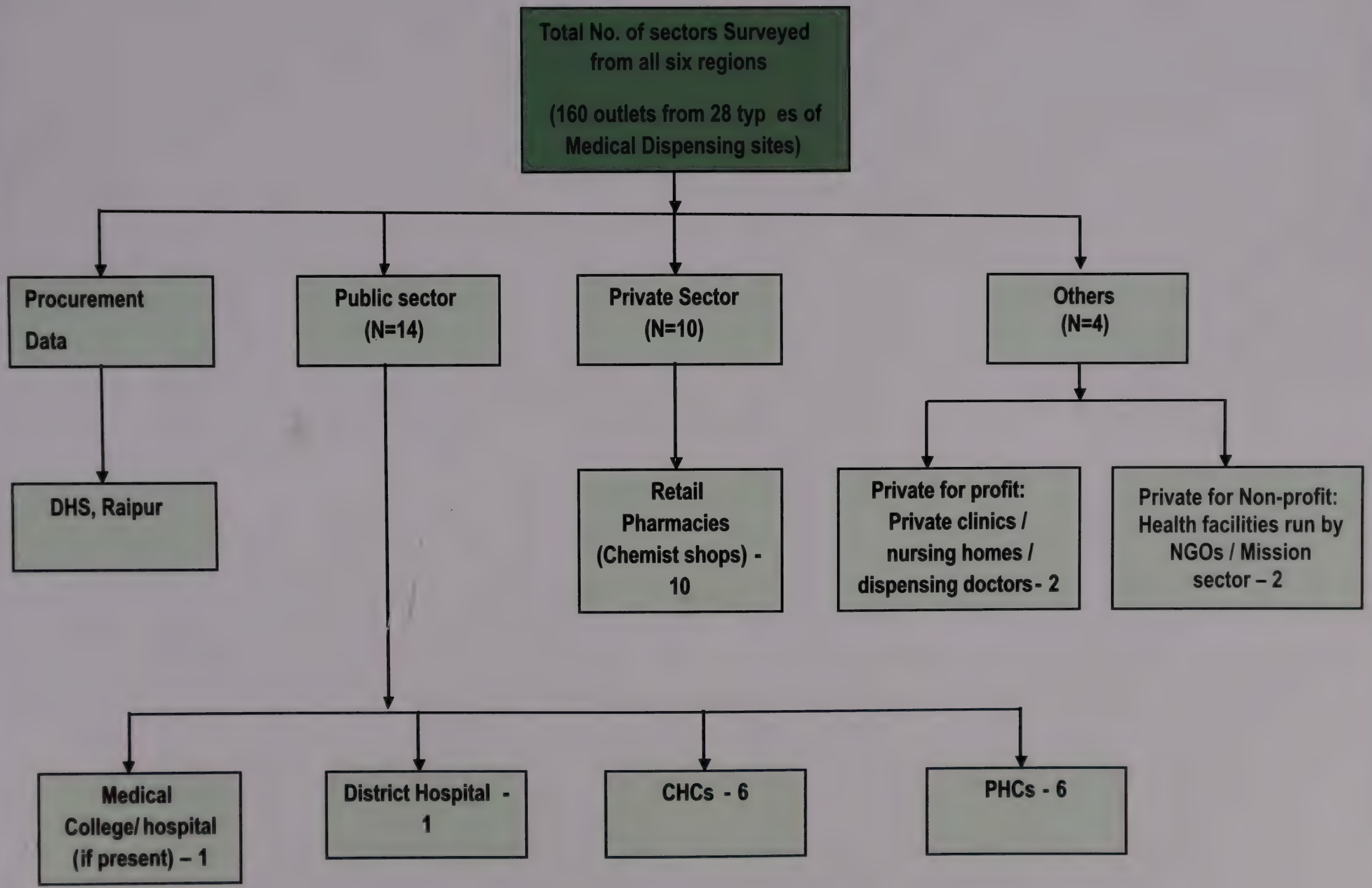
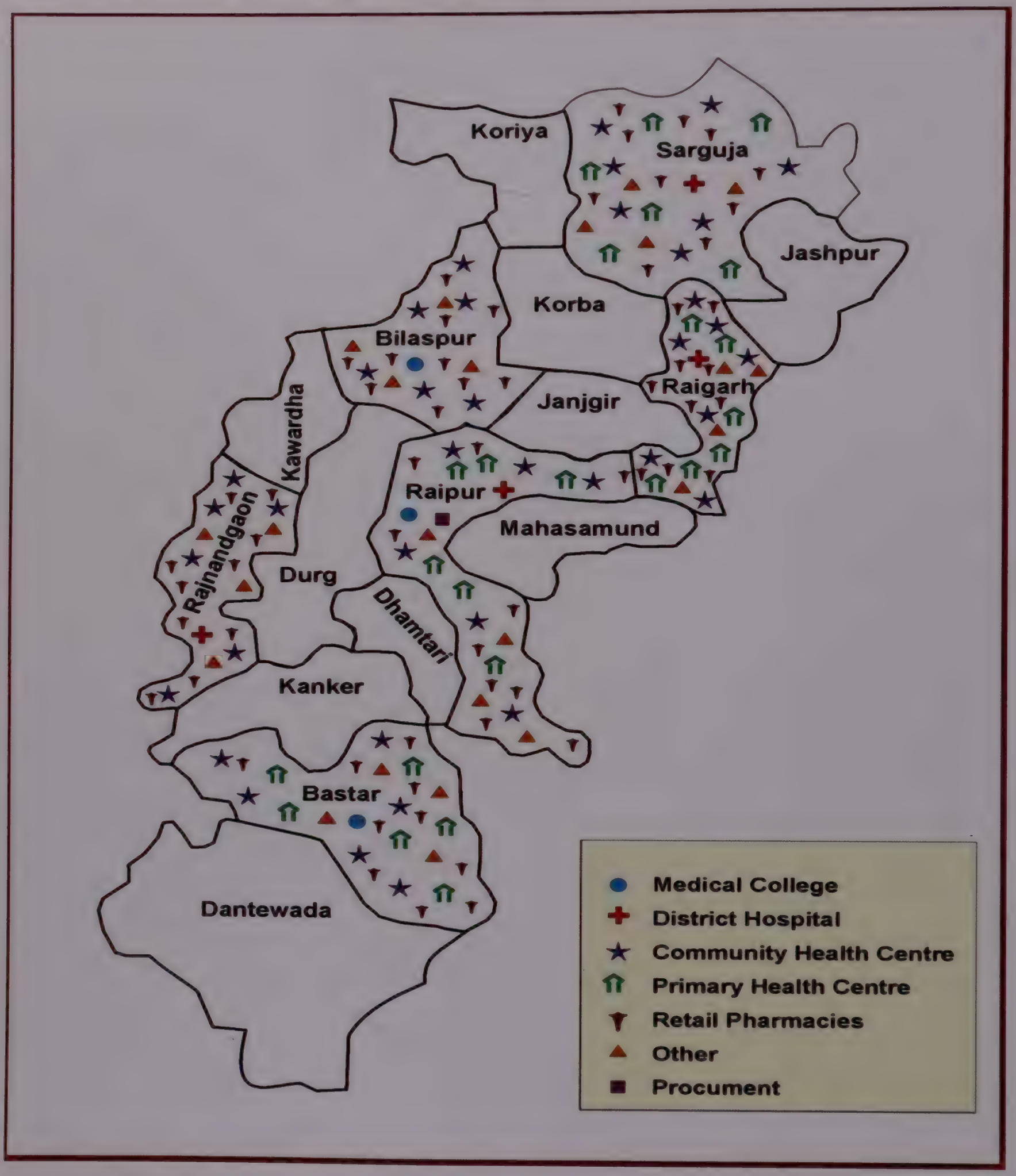


Figure 5: Facility mapping (Geographical location) of various sectors surveyed in Chhattisgarh State



Medicines surveyed

SHRC (State Health Resource Centre) conducted a series of consultative meetings in collaboration with WHO team, Pharmacology department officials, Medical College, Raipur and other concerned stakeholders in finalizing the list of medicines for conducting the survey. Following this a list of 50 medicines plus one device (spacer device) were selected for

the purpose of the survey in Chhattisgarh (Table 3). In this 30 medicines were pre-determined by WHO/HAI for surveys undertaken for international comparisons and 21 selected from the list of locally important for the state coupled with predetermined dose forms & strengths, & recommended pack sizes. For each medicine, two products are surveyed:

Highest-priced product

product with the highest price found at each medicine outlet; can be either the original pharmaceutical product first authorized for marketing, normally as a patented product, or a generic equivalent.

Lowest-priced generic (LPG)

products other than originator brand that contain the same active ingredient, whether marketed under another brand name or the generic name

- generic with the lowest price found at each medicine outlet, so will therefore vary from outlet to outlet

Following all these deliberations and consultations the following medicines were included in the list for survey on availability and price.

Table 3.: List of medicines surveyed in Chhattisgarh State

Sl. No	Generic Name – Dosage form – Strength
1	Amoxicillin 125mg/5ml Suspension/ Dry Syrup
2	Amoxicillin 125mg/5ml /Dry Powder for Oral Suspension
3	Amoxicillin 250mg Dispersible Tablet
4	Amoxicillin + Clavulanic acid 125mg + 31.25mg/5ml Suspension
5	Amoxicillin + Clavulanic acid 250mg + 125mg Dispersible Tablet
6	Artemether + Lumefantrine 120mg + 20mg Dispersible Tablet
7	Artemether + Lumefantrine 240mg + 40mg/5ml Dry Syrup
8	Beclomethasone 100mcg/dose Inhaler
9	Benzylpenicillin 600mg = 1 million IU Injection
10	Carbamazepine 100mg/5ml Suspension
11	Carbamazepine 100mg Chewable Tablet
12	Ceftraixone 500mg Vial for Injection
13	Cotrimoxazole (Sulfamethoxazole + Trimethoprim) 400mg + 80mg Tablet
14	Cotrimoxazole (Sulfamethoxazole + Trimethoprim) 200mg + 40mg/5ml Suspension
15	Diazepam 5mg rectal Suppository
16	Ferrous Salt 30mgFe/5ml Suspension
17	Ferrous Salt 50mg/ml Drops
18	Gentamycine 10mg/ml Injection

Sl. No	Generic Name – Dosage form – Strength
19	Ibuprofen 100mg/5ml Suspension
20	Isoniazid 100mg Tablet
21	Oral rehydration solution (ORS) to make 200ml
22	Oral rehydration solution (ORS) to make 1litre
23	Paracetamol 120mg/5ml or 125mg/5ml Suspension/Syrup
24	Paracetamol 100mg/ml Drops
25	Paracetamol 125mg Dispersible tablet
26	Paracetamol 250mg Suppository
27	Phenobarbital 200mg/ml Injection
28	Phenobarbital 20mg/5ml Syrup/ Oral liquid
29	Phenytoin 30mg/5ml Suspension
30	Phenytoin 50mg Chewable Tablet
31	Procaine 4 lakh IU Injection
32	Salbutamol 100mcg/dose Inhaler
33	Vitamin 25 000 IU Capsule
34	Zinc 20mg Tablet (dispersible)
35	Chloroquine 50mg/5ml Suspension
36	Chloroquine 250mg Tablet
37	Quinine 150mg/5ml Suspension
38	Quinine 100mg Tablet
39	Quinine 300mg/ml Injection
40	Sulphadoxine + Pyrimethamine 250mg + 12.5mg/5ml Suspension
41	Sulphadoxine + Pyrimethamine 500mg + 25mg Tablet
42	Albendazole 400mg/10ml Suspension
43	Albendazole 400mg Chewable Tablet
44	Promethazine 5mg/5ml Syrup
45	Azithromycin 100mg Tablet
46	Azithromycin 100mg/5ml Syrup
47	Folic Acid 5mg Tablet
48	Prednisolone 5mg Tablet
49	Salmeterol + Fluiticasone 25mcg + 125mcg/dose Inhaler
50	Metronidazole 200mg/5ml Suspension

Data Collection, data entry and quality assurance

Data collection was conducted by a team of trained personnel. These investigators were provided a two days intensive residential training coupled with a field level training on survey methods for in-depth understanding of field related practical problems.

The data collected from the field were entered in the WHO-HAI – workbook – version – 5 – MSH2009 – Part I for analysis. These data were cross checked and verified at the field level through supervisors and further it was cross verified by state coordinators. Subsequently, a trained data operator entered the data in the workbook as per standard method. Further the data were double entered in the workbook for authenticity and quality check wherein any flaw or discrepancy if any in the first entry is rectified.

Ethical issues

For the purpose of this survey all necessary formalities of fulfilling the ethical consideration and clearance from the ethical committee was followed. The ethical committee of Medical College, Raipur, had given their approval and consent for the same. Also, the issue of confidentiality of those sectors surveyed was assured from the project team's end. Besides endorsements and consent from the Director, Health Services, Chhattisgarh and from the department concern (Chhattisgarh Chemists and Druggists Association (CCDA)/Food & Drug Controller) was assured prior to conducting the survey. There are no issues of conflict of interest in this study.

Study on Price components

During the second phase of the study a separate survey was conducted 1.)to know the different components of the final price the patient has to pay as well as 2.) to know when and where additional costs were added on in stages.

Five medicines were selected for the detailed study of components of price of medicine (ceftriaxone 500mg injection, salbutamol inhaler 200 dose, albendazole 400mg chewable tablet, carbamazipine 100mg/5ml suspension and paracetamol 125mg/5ml syrup) out of 50 medicines undertaken for this project. These 5 medicines were selected to reflect different dosages/forms like injection, inhaler, syrup, suspension and chewable tablet. Some medicines like salbutamol inhaler are under the category of "price controlled medicine" by the Ministry of Petroleum & Chemicals where in price variations are least expected.

Under the price component study, the five tracer medicines were tracked backwards through the distribution chain through visits to retailers, wholesalers and manufacturer's branch offices (clearing & forwarding) to identify the charges applied (e.g. transportation/shipping and storage from manufacturing unit to retailer chemist, insurance, customs, taxes, warehouse charges, freight charges, wholesale/retail mark-ups). The data collected on the components of medicine prices were entered into the WHO/HAI workbook and analysed according to five common stages of the supply chain:

- ☞ manufacturer's selling price + insurance and freight (Stage 1);
- ☞ landed price (Stage 2);
- ☞ wholesale selling price (private) or central medical stores price (public) (Stage 3);
- ☞ retail price (private) or dispensary price (public) (Stage 4); and
- ☞ dispensed price (Stage 5).

Analysis includes the cumulative percent mark-up at the end of each stage, the total cumulative percent mark-up, and the percent contribution of individual components to the final medicine price.

Results

1. Medicine availability

In this section we depict and discuss the availability of various products in different sectors. A general depiction of a collective whole as well as categorization has been presented in order to understand the overall availability as well as that of specific products in all four sectors as designed so as to see the differences in the particular types of medicines available in each sectors.

1.1 Availability of different products (medicines) surveyed

The average availability of paediatric medicines was sub-optimal in all sectors (Figure 6). In public sector and NGO/mission sector facilities overall availability was only 17%. In the public sector more than half (29/50) of the study medicines were not available in any of the facilities surveyed, and only 6 medicines have availability of 80% or higher. Of the 29 medicines not found in the public sector, several also had poor or no availability in the private sector (Table 4). In retail pharmacies and other private, for-profit outlets availability was higher at 46% and 35%, respectively, but was still inadequate. The availability of individual medicines is available in

Annex 1. : Figure 6. Average availability of the lowest-priced versions of 50 paediatric medicines in different sectors

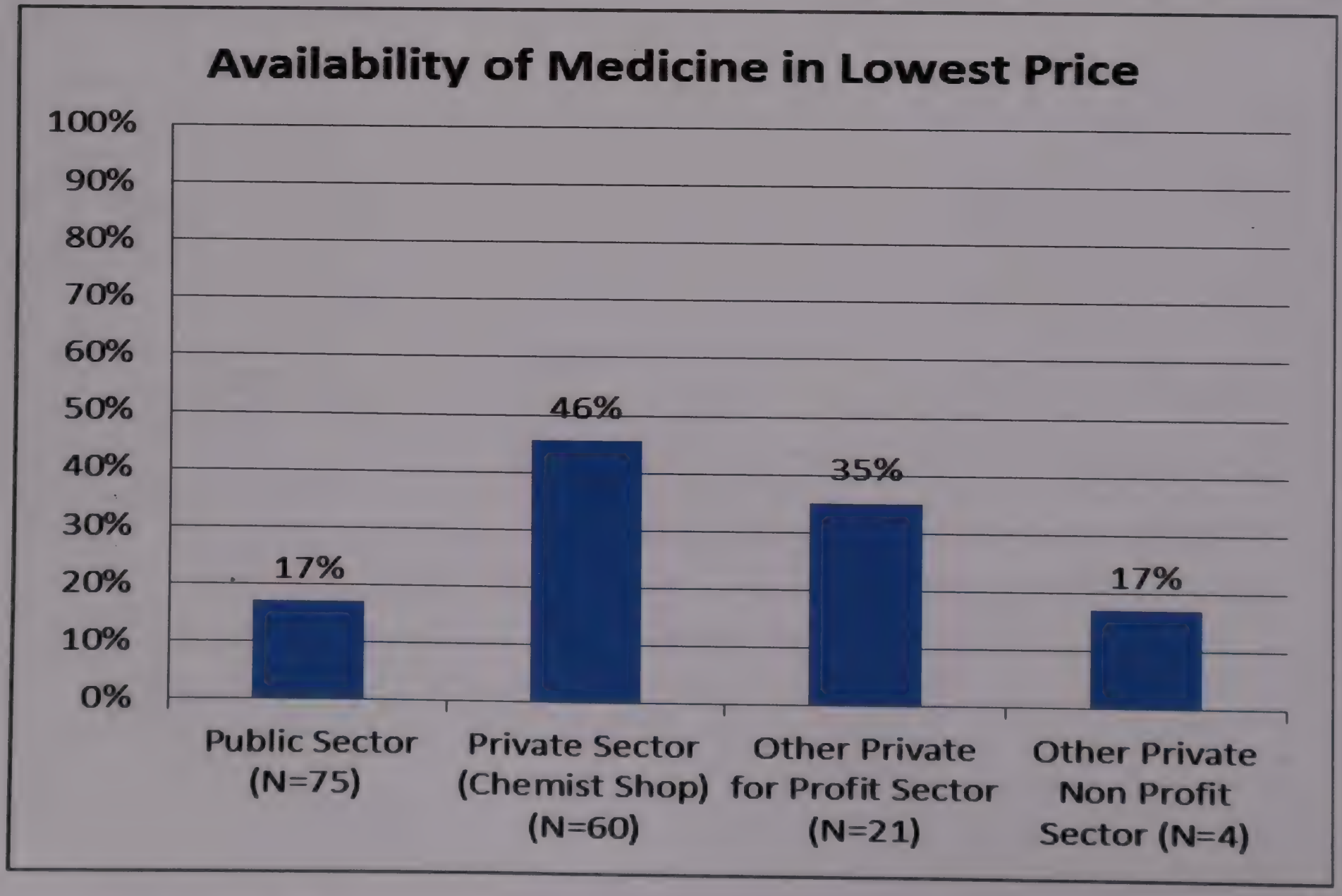
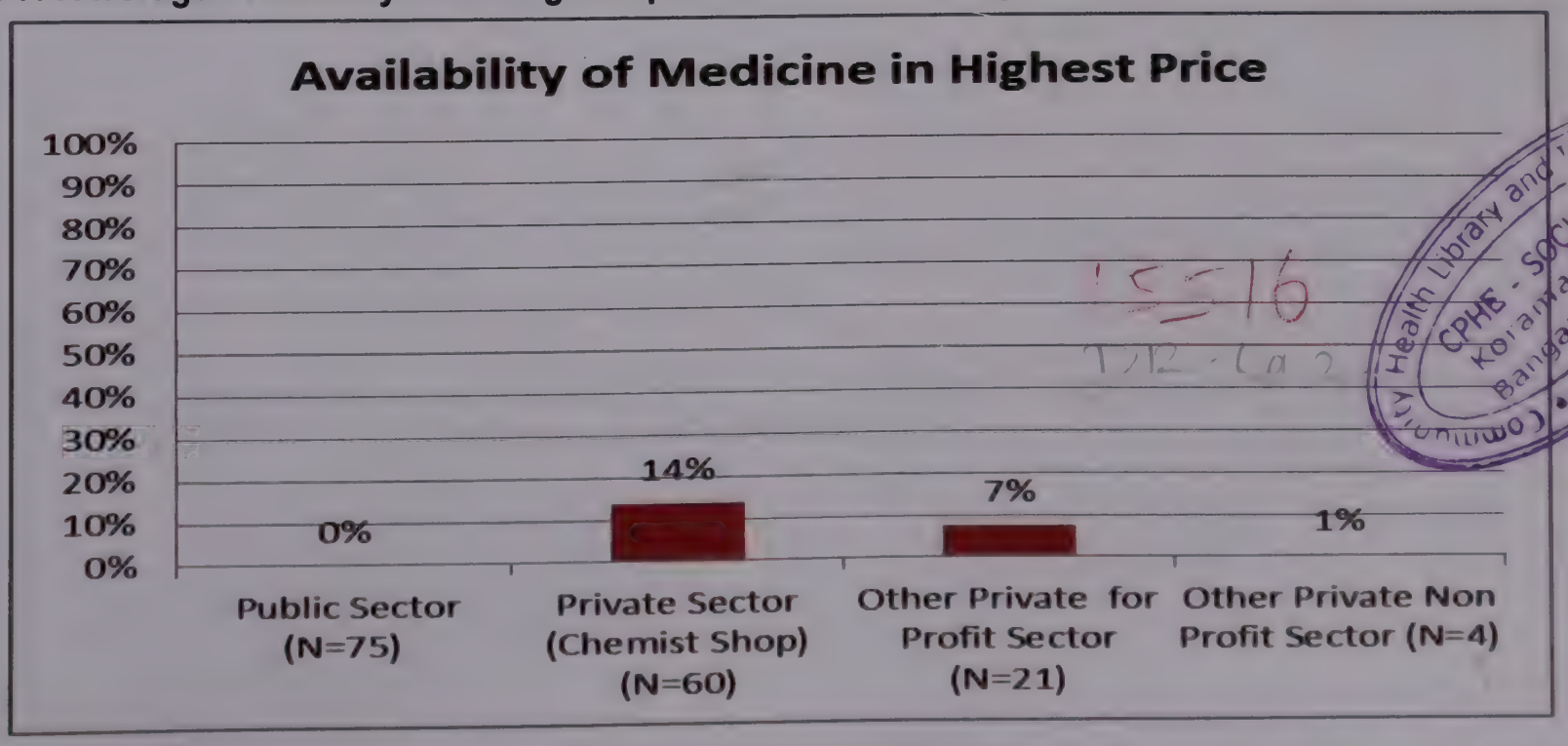


Table 4. : Medicines not found in the public sector which also had poor availability (<20%) in the private sector

Medicine	Public sector (n=75)	Private sector (n=60)
Ferrous salt suspension	0.0%	0.0%
Diazepam rectal suppository	0.0%	0.0%
Phenobarbital injection	0.0%	0.0%
Phenytoin tablet – chewable	0.0%	0.0%
Paracetamol suppository	0.0%	0.0%
Ferrous salt drops	0.0%	1.7%
Beclomethasone inhaler	0.0%	1.7%
Salmeterol + fluticasone inhaler	0.0%	5.0%
Artemether + lumefantrine dispersible tablet	0.0%	8.3%
Phenobarbital syrup/oral liquid	0.0%	10.0%
Artemether + lumefantrine dry syrup	0.0%	13.3%
Phenytoin suspension	0.0%	15.0%
Gentamicin injection	0.0%	16.7%

Highest-priced products were unavailable in the public sector and were virtually unavailable in the non-profit sector, indicating that these facilities are only stocking product for each medicine (Figure 7). In retail pharmacies and other private, for-profit outlets, the availability of highest price medicines was not as high as anticipated (14% and 7%, respectively). This indicates that the private and the private for profit sector are sometimes stocking more than one product for individual medicines.

Figure 7. : Average availability of the highest-priced versions of 50 paediatric medicines in different sectors



1.2 Availability of medicines by therapeutic class

Table 5 shows the availability of individual medicines grouped by therapeutic class. Of particular note is the fact that ferrous salt is virtually unavailable in all sectors. Antiepileptics also show poor availability, particularly in the public and non-profit sectors. Antiepileptics were virtually unavailable in public sector facilities. In private pharmacies, carbamazepine products showed moderate availability (25-50%) while other antiepileptics had low or no availability

Therapeutic group	Medicine Name	Public (n=75)	Private (n=60)	Other private, for-profit (n=21)	Other private, non-profit (n=4)
Antianaemia	Folic acid tab	20.5%	81.7%	90.5%	50.0%
Antianaemia	Ferrous salt drops	0.0%	1.7%	0.0%	0.0%
Antianaemia	Ferrous salt suspension	0.0%	0.0%	0.0%	0.0%
Antiasthmatic	Prednisolone tablet	49.4%	85.0%	81.0%	75.0%
Antiasthmatic	Salbutamol inhaler	0.0%	76.7%	52.4%	0.0%
Antiasthmatic	Promethazine syrup	0.0%	46.7%	52.4%	25.0%
Antiasthmatic	Salmeterol + fluticasone inhaler	0.0%	5.0%	19.0%	0.0%
Antiasthmatic	Beclomethasone inhaler	0.0%	1.7%	9.5%	0.0%
Antibiotics	Co-trimoxazole tablet	89.2%	90.0%	38.1%	0.0%
Antibiotics	Co-trimoxazole suspension	81.9%	88.3%	38.1%	25.0%
Antibiotics	Metronidazole suspension	54.2%	60.0%	61.9%	0.0%
Antibiotics	Amoxicillin powder for suspension	36.1%	61.7%	28.6%	25.0%
Antibiotics	Procaine penicillin injection	28.9%	41.7%	9.5%	25.0%
Antibiotics	Benzylpenicillin injection	26.5%	6.7%	33.3%	25.0%
Antibiotics	Amoxicillin suspension	2.4%	68.3%	14.3%	0.0%
Antibiotics	Ceftriaxone injection	0.0%	96.7%	71.4%	25.0%
Antibiotics	Amoxicillin dispersible tablet	0.0%	71.7%	28.6%	0.0%
Antibiotics	Azithromycin syrup	0.0%	68.3%	71.4%	25.0%
Antibiotics	Amoxicillin + clavulanic acid dispersible tab	0.0%	28.3%	28.6%	0.0%
Antibiotics	Azithromycin tablet	0.0%	28.3%	23.8%	0.0%
Antibiotics	Amoxicillin + clavulanic acid suspension	0.0%	21.7%	14.3%	0.0%

Antibiotics	Gentamicin injection	0.0%	16.7%	19.0%	25.0%
Antiepileptic	Carbamazepine tab - chewable	3.6%	48.3%	33.3%	0.0%
Antiepileptic	Carbamazepine suspension	0.0%	26.7%	9.5%	0.0%
Antiepileptic	Phenytoin suspension	0.0%	15.0%	28.6%	25.0%
Antiepileptic	Phenobarbital syrup/oral liquid	0.0%	10.0%	19.0%	0.0%
Antiepileptic	Diazepam rectal suppository	0.0%	0.0%	0.0%	0.0%
Antiepileptic	Phenobarbital injection	0.0%	0.0%	33.3%	0.0%
Antiepileptic	Phenytoin tablet - chewable	0.0%	0.0%	0.0%	0.0%
Antimalarial	Chloroquine tablet	89.2%	93.3%	42.9%	50.0%
Antimalarial	Quinine injection	9.6%	43.3%	52.4%	50.0%
Antimalarial	Sulphadoxine + pyrimethamine tab	3.6%	85.0%	38.1%	25.0%
Antimalarial	Chloroquine suspension	1.2%	90.0%	57.1%	25.0%
Antimalarial	Sulphadoxine + pyrimethamine suspension	0.0%	68.3%	42.9%	0.0%
Antimalarial	Quinine suspension	0.0%	61.7%	47.6%	25.0%
Antimalarial	Quinine tablet	0.0%	23.3%	4.8%	0.0%
Antimalarial	Artemether + lumefantrine dry syrup	0.0%	13.3%	9.5%	0.0%
Antimalarial	Artemether + lumefantrine dispersible tablet	0.0%	8.3%	4.8%	0.0%
Antituberculosis	Isoniazid tab	19.3%	3.3%	9.5%	0.0%
Intestinal anthelminthics	Albendazole tablet - chewable	85.5%	83.3%	81.0%	100.0%
Intestinal anthelminthics	Albendazole suspension	37.3%	95.0%	76.2%	75.0%
Medicines used in diarrhoea	Oral rehydration solution (for 1L)	92.8%	86.7%	52.4%	75.0%
Medicines used in diarrhoea	Zinc dispersible tablet	28.9%	0.0%	0.0%	0.0%
Medicines used in diarrhoea	Oral rehydration solution (200ml)	1.2%	83.3%	85.7%	0.0%
NSAIMs	Paracetamol suspension	84.3%	95.0%	81.0%	50.0%
NSAIMs	Paracetamol drops	0.0%	91.7%	81.0%	0.0%
NSAIMs	Paracetamol dispersible tab	0.0%	31.7%	4.8%	0.0%
NSAIMs	Ibuprofen suspension	0.0%	26.7%	33.3%	0.0%
NSAIMs	Paracetamol suppository	0.0%	0.0%	9.5%	25.0%
Vitamins	Vitamin A capsule	0.0%	45.0%	23.8%	0.0%

For the treatment of diarrhoea, it was found that ORS (1L) had reasonable availability (> 80%) in public facilities and retail pharmacies (Figure 8). The availability of the 200ml pack varied largely across sectors. High availability was observed in private pharmacies and other private, for-profit facilities, while in public and non-profit facilities it was virtually unavailable. In the public sector this may be due to the fact that the 200ml pack was not promoted until recently. Zinc dispersible tablets were only available in the public sector, and even here availability was low at 29% (Figure 9).

Figure.8 : Availability of oral rehydration solution across sectors

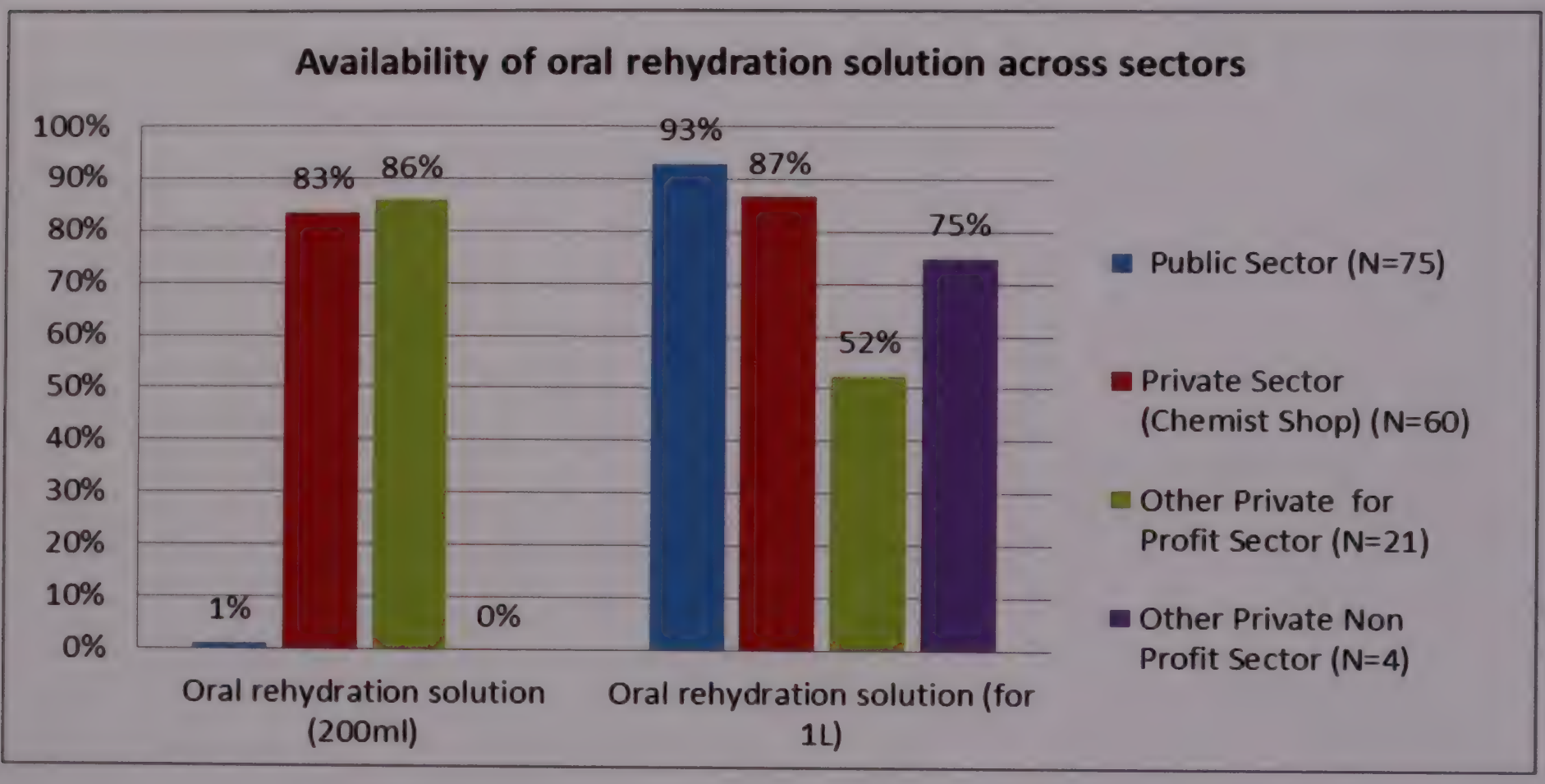


Figure 9. : Availability of zinc dispersible tablet across sectors

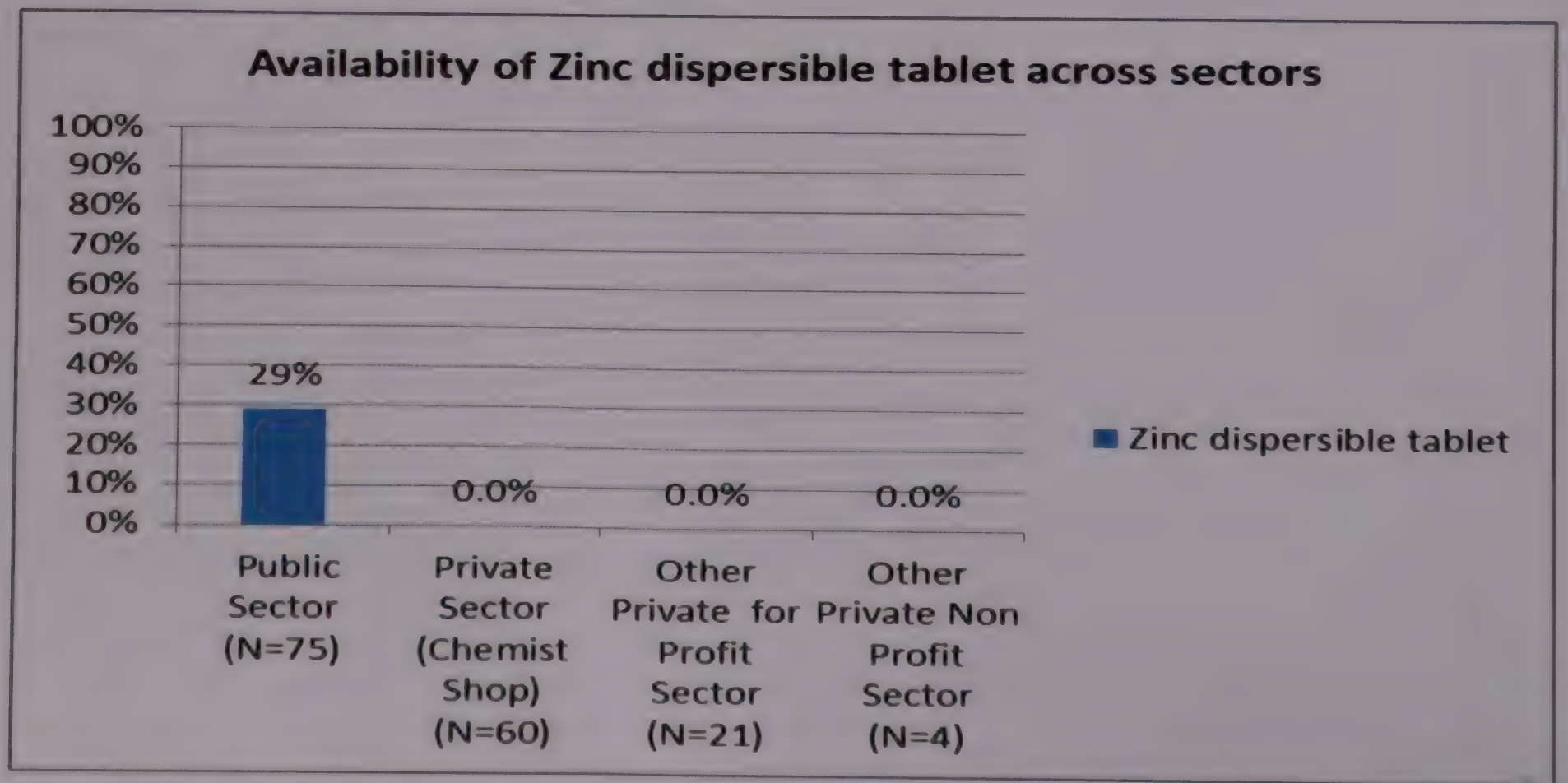
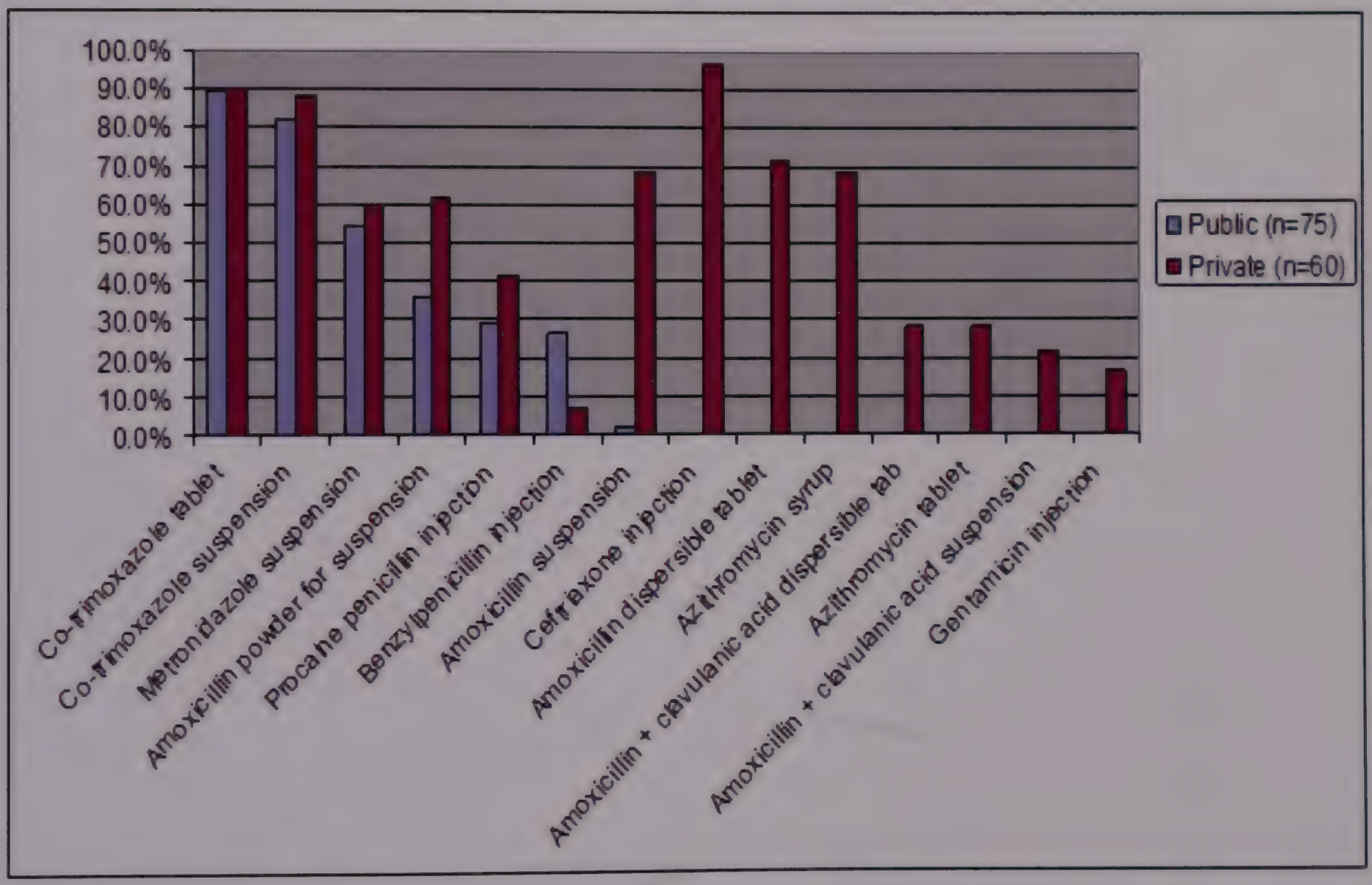


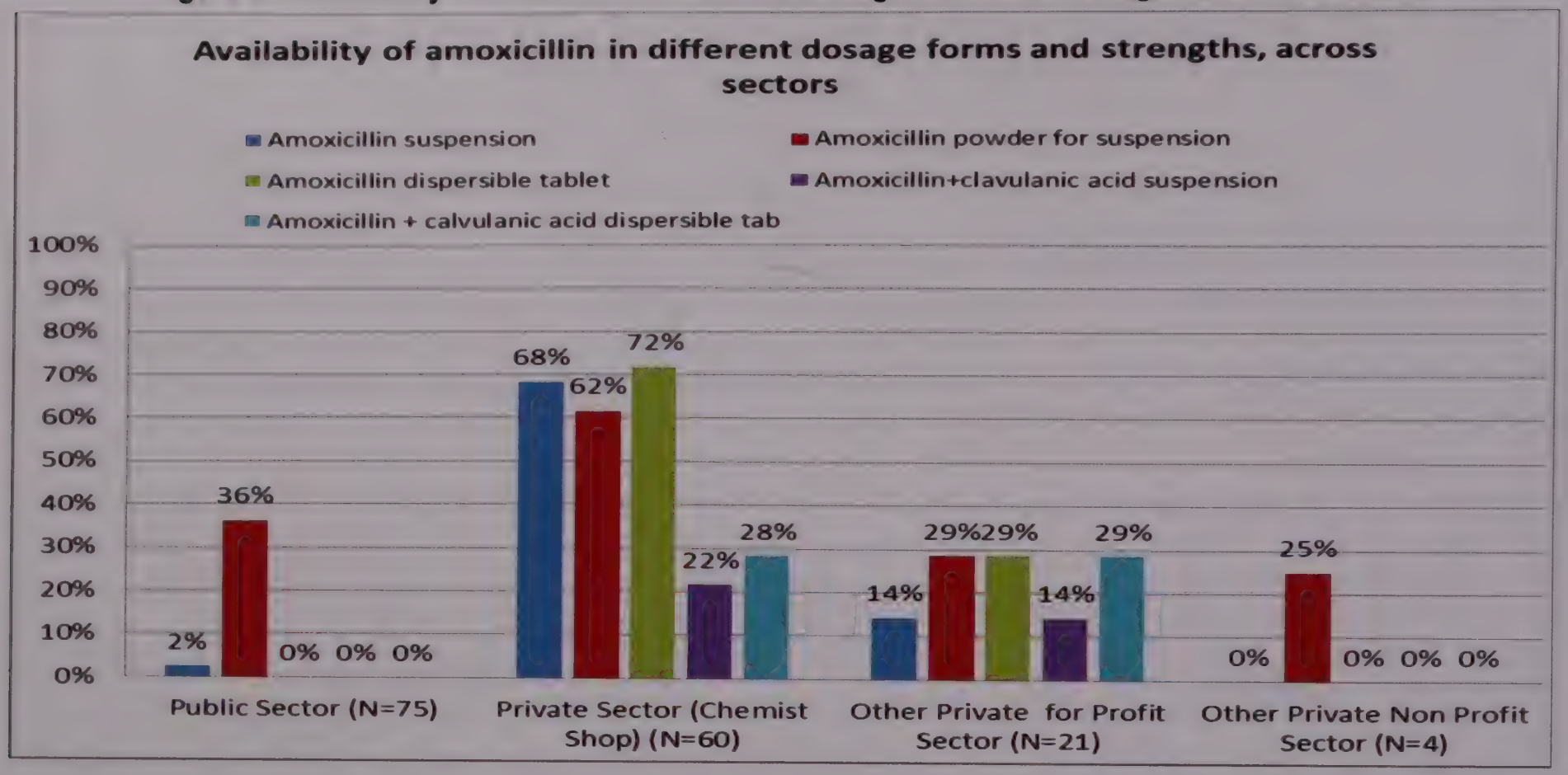
Figure 10 shows the availability of antibiotics in public facilities and retail pharmacies. Co-trimoxazole had the highest availability of all antibiotics, with both tablet and suspension forms available in over 80% of public facilities and retail pharmacies. Ceftriazone also showed high availability in the private sector, but was not available in the public sector. While metronidazole suspension, amoxicillin powder for suspension, procaine penicillin and benzylpenicillin injections showed moderate availability in the public sector (20-60%), several other antibiotics were not available. Of the products not available in the public sector, ceftriaxone injection, amoxicillin dispersible tablet and azithromycin syrup had moderate to reasonable availability (>60%) in the private sector, while amoxicillin + clavulanic acid suspension and dispersible tablet, azithromycin tablet, and gentamicin injection had low availability (<30%).

Figure 10. : Availability of selected antibiotics in public facilities and retail pharmacies (chemist shops)



When the availability of amoxicillin products is studied across sectors, they are found to be least available in the public and private non-profit sectors (Figure 11). In these two sectors amoxicillin powder for suspension was the predominant dosage form found, though even the availability of this product was low (36% and 25% in the public and non-profit sectors, respectively). The highest and overall availability is observed in the private followed by private for profit sectors. Across the amoxicillin products studied the highest availability was observed in the private sector; here, reasonable availability (>70%) of both the suspension and the dispersible tablet was found.

Figure 11. Availability of amoxicillin in different dosage forms and strengths, across sectors



While looking at the availability of antimalarials across sectors, it can be seen that in the public sector chloroquine tablets were the only product with reasonable availability (89%) (Figure 12). Other products had minimal availability (<10%) or were not found at all. In retail pharmacies availability of over 80% was observed for chloroquine tablets and suspension and sulphadoxine + pyrimethamine (SP) tablets, while SP and quinine suspensions had availability of 68%, 62%, respectively. Artemether-lumefantrine products were not available in the public or non-profit sectors, and had had low availability (<15%) in private pharmacies and other private for-profit facilities. The availability of child-friendly formulations of chloroquine and quinine in the public sector is poor (Figure 13).

Figure 12. Availability of antimalarials across sectors

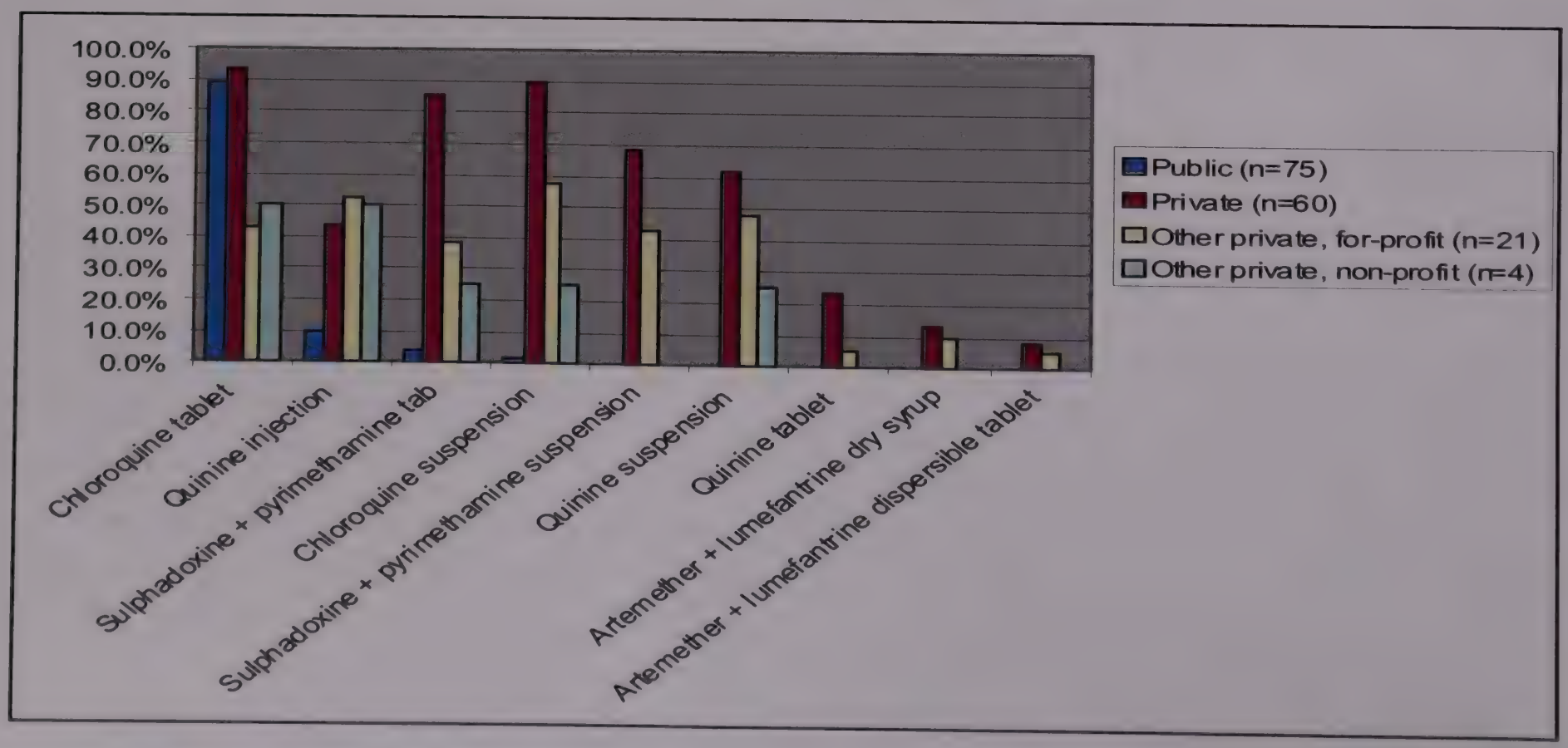
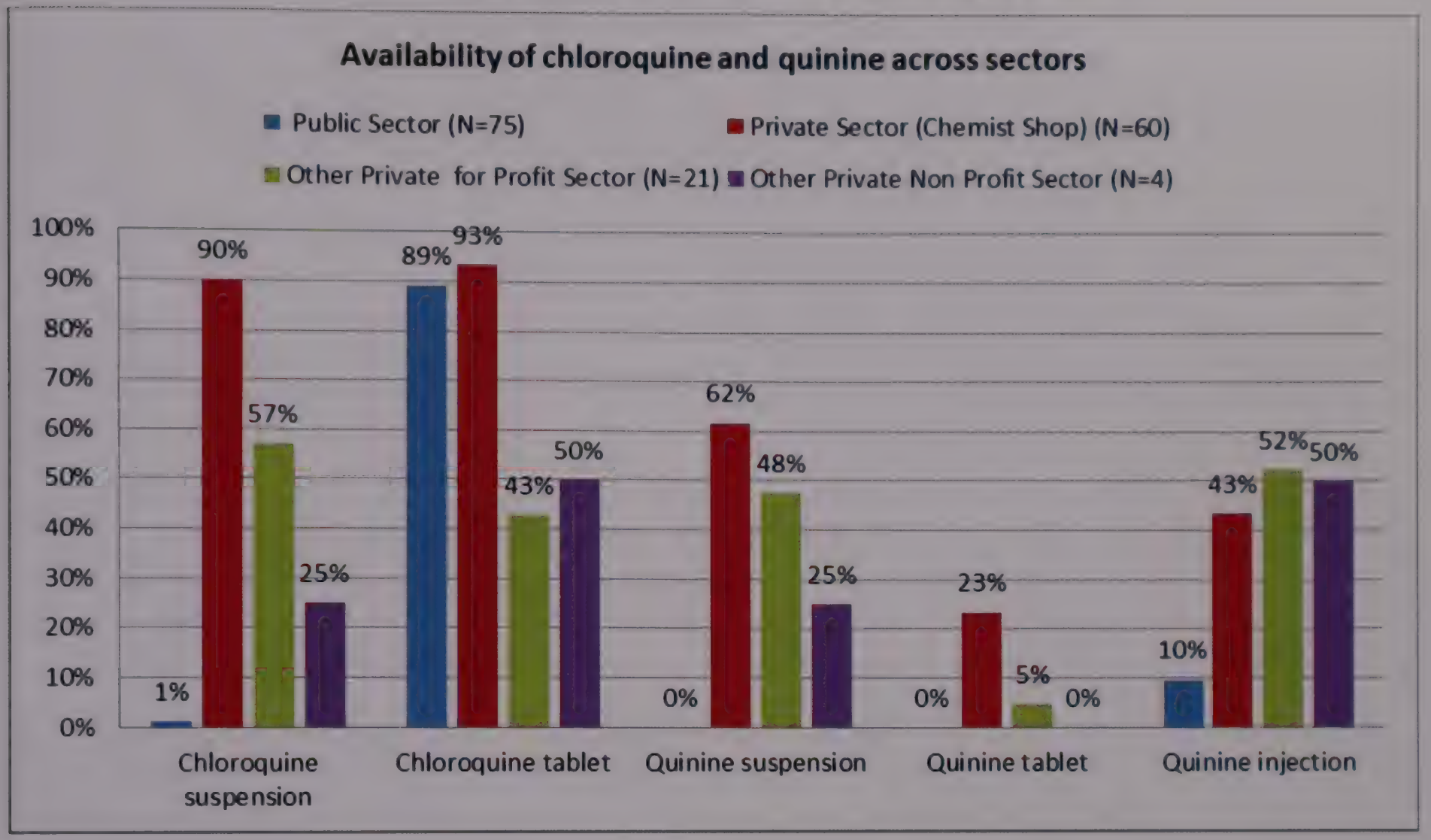


Figure 13 Availability of chloroquine and quinine across sectors



2. Medicine prices

In this section we have analysed median local prices of both highest-priced and lowest-priced products as a function of their international reference price (median price ratio, MPR). This has been done in order to observe and understand the price variation of medicines in all four sectors in relation to international prices so as to gauge the types of products with higher price range and those products available at a lower range or equivalent to international prices. All these observation and analysis could bring out a clearer picture as to how and why the differences for further analysis. As medicines are provided free-of-charge in public facilities, price results are presented for public sector procurement, private pharmacies, and other private for-profit outlets. For other private non-profit outlets, limited price data was available due to the small number of outlets surveyed (4). Only one medicine (albendazole) had the required four prices to enable calculation of the median price ratio (see Section 2.4).

2.1 Public sector procurement prices

Overall, the public procurement agency is purchasing medicines at prices that are just under international reference prices (MPR = 0.96), indicating a reasonable level of purchasing efficiency. The 25th and 75th percentiles indicate a moderate amount of variation across the purchase price of individual medicines, with half of the medicines being purchased at 0.71 to 0.99 times their international reference price. The median price ratios of individual medicines is available in Annex 2.

Table 6. Public sector procurement - ratio of median unit prices to MSH international reference prices (median price ratio or MPR)

Product type	Median MPR	25th percentile	75th percentile
Lowest price generic (n = 13 medicines)	0.96	0.71	0.99

2.2 Private sector patient prices

As shown in Table 7, patients in private pharmacies are paying 1.82 and 1.32 times the international reference price, on average, to purchase highest-priced and lowest-priced products, respectively. Substantial variartion is observed across individual medicines, with one-quarter of highest-priced and lowest-priced products costing over 4.12 and 2.25 times their international reference price, respectively. The median price ratios of individual medicines are available in Annex 3.

Table 7. Patient prices in private pharmacies- ratio of median unit price to MSH international reference price (median price ratio or MPR)

Product type	Median MPR	25th percentile	75th percentile
Highest-priced (n = 21 medicines)	1.82	1.27	4.12
Lowest-priced (n = 30 medicines)	1.38	1.13	2.25

In Table 8, only those medicines for which both the highest-priced and lowest-priced products were found were included in the analysis to allow for the comparison of prices between the two product types. Results show that in the private sector, highest-priced products cost 8.3% more, on average, than their lowest-price equivalents.

Table 8. Comparison of the prices of originator brands and generically equivalent products: Median MPRs for medicines found as both product types

Type (n = 21 medicines)	Median MPR	25th percentile	75th percentile
Highest-priced	1.82	1.27	4.12
Lowest-priced	1.68	1.27	3.81

2.3 Patient prices in other private, for-profit medicine outlets

For other private, for-profit medicine outlets it was found that prices were, on average, 2.6 and 1.5 times their international reference price for highest-priced and lowest-priced products, respectively (Table 9). The median price ratios of individual medicines is available in Annex 3.

Table 9. : Patient prices in other private, for-profit outlets- ratio of median unit price to MSH international reference price (median price ratio or MPR)

Product type	Median MPR	25th percentile	75th percentile
Highest-priced (n = 6 medicines)	2.59	2.09	15.99
Lowest-priced (n = 27 medicines)	1.46	1.14	2.36

In Table 10, only those medicines found in both private pharmacies and other private for-profit outletswere included in the analysis to allow for the comparison of prices between the two sectors. Results show that final patient prices in private pharmacies and other private, for-profit outlets were comparable, with the latter only slightly higher.

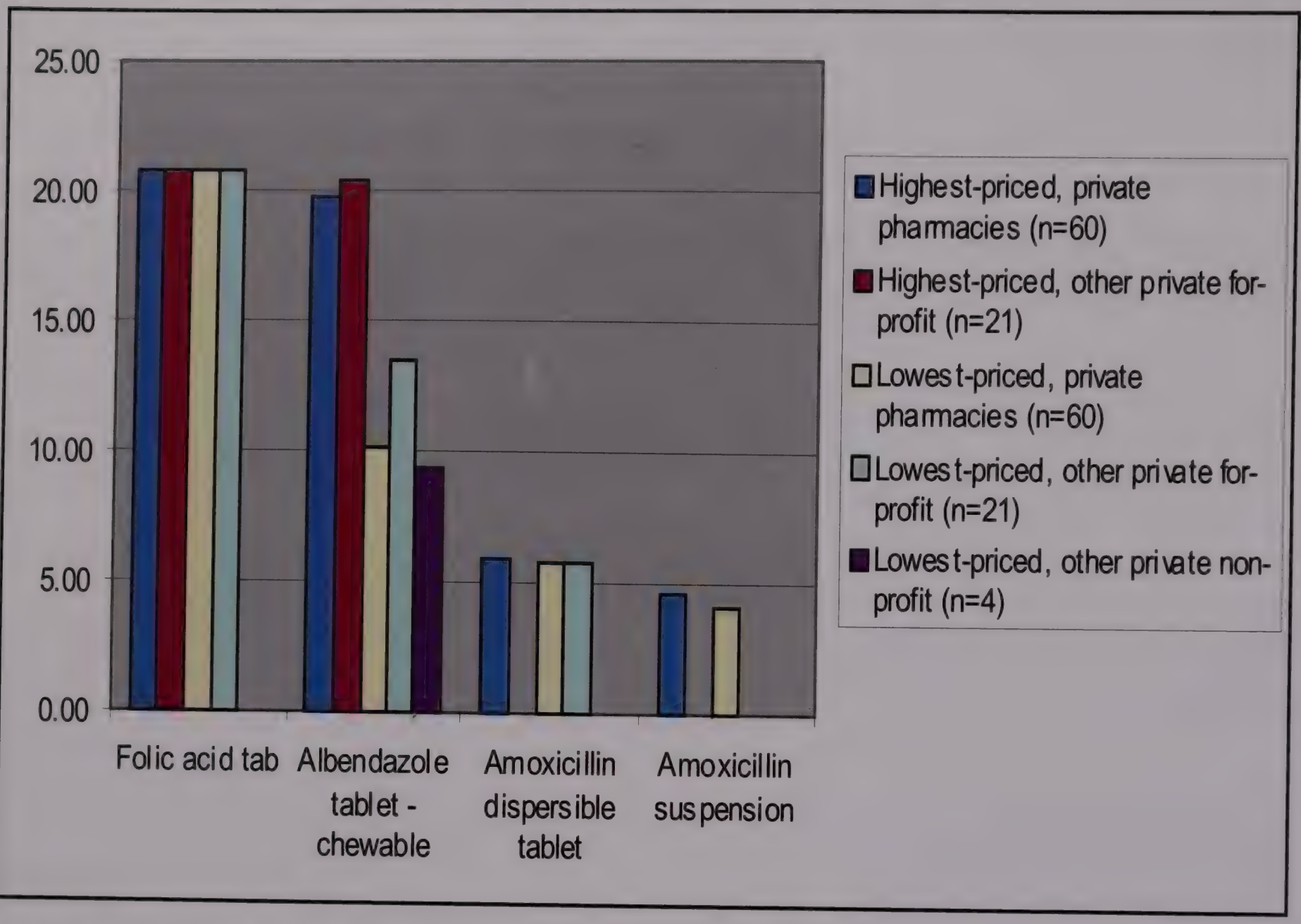
Table 10. : Median MPRs for medicines found in both private pharmacies and other private for-profit outlets

Product type	Median MPR Private pharmacies	Median MPR Other private, for-profit outlets	% difference private to public
Highest-priced (n = 6 medicines)	2.58	2.59	0.6%
Lowest-priced (n = 27 medicines)	1.36	1.43	5.7%

2.4 Patient prices of individual medicines

Medicines that had median price ratios of over 4 in all three private sectors are shown in Figure 14. Folic acid tablets showed the highest median price ratio of all medicines in the survey (20.88). The price was the same for both highest-price and lowest-price products and did not vary by sector. Albendazole chewable tablets were the next highest-priced product. In private pharmacies and other private for-profit outlets the highest priced product was approximately 20 times the international reference price, while the lowest priced product was 10 and 13 times higher, respectively. Even in the non-profit sector the lowest priced product was close to 10 times the international reference price. Amoxicillin dispersible tablets were consistently priced at close to 6 times the international reference price in both private pharmacies and other private, for-profit outlets. In private pharmacies amoxicillin suspension 4.6 and 4.1 times the international refernece price for the highest-priced and lowest-priced products, respectively.

Figure 14. : Median price ratios of medicines with patient prices of over four times the international reference price in all sectors



3. Affordability of standard treatment regimens

The affordability of treatment for five common conditions was estimated as the number of days' wages of the lowest-paid unskilled government worker needed to purchase medicines prescribed at a standard dose. The daily wage of the lowest-paid unskilled government worker used in the analysis was Rs 165.

Because of extreme low availability of children's medicine in public sector most of the patients are forced to purchase medicines from private sector. In the private sector, the affordability of both lowest-priced and highest-priced generics was reasonable for all conditions, with standard treatment costing about a days' wage or less (Table 11). However, it should be noted that treatment costs refer to medicines only and do not include the additional costs of consultation and diagnostic tests. Further, many people in Chhattisgarh earn significantly less that the lowest government wage; as such even treatments which appear affordable are too costly for the poorest segments of the population. Finally, even where individual treatments appear affordable, individuals or families who need multiple medications may quickly face unmanageable drug costs.

Table 11. : Number of days' wages of the lowest paid government worker needed to purchase standard treatments

Disease condition and 'standard' treatment			Private Sector Median Treatment Price (Rs)		Days Wages	
Childhood Condition	Drug name, strength, dosage form	Treatment schedule	Highest-price	Lowest-price	Highest-price	Lowest-price
Asthma	Salbutamol 100 mcg/dose inhaler	1 inhaler of 200 doses	---	95.00	---	0.6
Diarrhoea	ORS for 1 Lit	1 packet for 24 hrs	15.00	14.25	0.1	0.1
Respiratory Infection	Amoxy(125) + Clavulanic dry Syp 125mg + 31.25mg for 30 ml	5ml thrice daily for 7 days		187.6		1.1
Falciparum Malaria	Artemether + Lumefantrine 20mg + 120mg dispersible tablet	1 tab twice daily For 3days		87.45		0.5
Fever	Paracetamol suspension 120 mg/5ml	5ml thrice daily for 3 days	21.19	18.75	0.1	0.1

4. Price components in the private sector

In the private sector, the principal contributors to the final patient price are the Manufacturer's Selling Price (MSP), wholesaler and retailer mark-ups, and value-added tax (VAT) of 5%. For originator brand and branded generic products, wholesale mark-ups ranged from 8 to 11%, retail mark-ups ranged from 17 to 25%, and the total cumulative mark-up from MSP to final price ranged from 34% to 46%. For unbranded generics, wholesale mark-ups ranged from 12-14%, retail mark-ups ranged from 298-338%, and the total cumulative mark-up ranged from 376% to 413%.

Table 12 shows the Percent contribution of each stage of the supply chain to final patient price for three ceftriaxone injection products. It can be seen that for branded generics, the MSP is the largest contributor to final patient price (approximately 70%). For the unbranded generic product the MSP only contributes about 20%, while the retail mark-up which contributes over 70% to the final patient price. No substantial difference is observed between urban and rural areas. Interestingly, the unbranded product has a higher final price than the branded generics as you can see in the case of Ceftriaxone 500 mg injection. The price to the patient for Ceftriaxone 500 mg injection produced by Akums Drug & Pharmaceuticals and marketed as a generic drug without brand name, Rs.69. versus Rs.42.5.This unethical marketing strategy to woo retailers to push only their product needs to be curtailed by Policy decisions and through law enforcement.

Table 12: Percent contribution of each stage of the supply chain to final patient price, ceftriaxone 500mg injection

Manufacturer	RURAL			URBAN		
	Akums Drug & Pharmaceutical	Aristo Pharmaceutical	Mankind	Akums Drug & Pharmaceutical	Aristo Pharmaceutical	Cerbry Trx
Product type	generic	Branded generic	Branded generic	Generic	Branded generic	Branded generic
MSP/CIF contribution	19.48%	69.31%	68.58%	21.02%	69.31%	70.43%
Stage 1 contribution	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Stage 2 contribution (Landed Price)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Stage 3 contribution (Wholesaler)	2.26%	7.15%	7.61%	2.90%	7.15%	6.30%
Stage 4 contribution (Retailer)	73.50%	18.77%	19.05%	71.32%	18.77%	18.51%
Stage 5 contribution (Dispensed Price)	4.76%	4.76%	4.76%	4.76%	4.76%	4.76%
Final price	69.00	42.50	38.00	68.99	42.50	37.00
Scheme* (Purchase Qty. + free qty)		5+1	5+2	-	5+1	5+1

*Schemes are extra incentives for retailers in addition to retailer mark up.

Table 13 shows the percent contribution of each stage of the supply chain to final patient price for originator brand salbutamol inhaler as well as for a branded generic. The mark-up structures are very similar between the two products and do not vary by geographical location (urban/rural). However the final price of the branded generic is substantially more in the rural area than in the urban area (102.00 vs 88.00) owing to a higher MSP (75.69 in the rural area vs. 65.93 in the urban area).

Table 13: Percent contribution of each stage of the supply chain to final patient price, salbutamol 100mcg/dose inhaler

Manufacturer	RURAL		URBAN	
	Cipla Ltd	GSK	Cipla Ltd	GSK
Product type	Branded generic	Originator brand	Branded generic	Originator brand
MSP/CIF contribution	74.21%	73.88%	74.92%	73.61%
Stage 1 contribution	0.00%	0.00%	0.00%	0.00%

Stage 2 contribution (Landed Price)	0.00%	0.00%	0.00%	0.00%
Stage 3 contribution (Wholesaler)	6.22%	6.12%	6.28%	6.41%
Stage 4 contribution (Retailer)	14.81%	15.24%	14.03%	15.21%
Stage 5 contribution (Dispensed Price)	4.76%	4.76%	4.76%	4.76%
Final price	102.00	98.00	88.00	98.00

Table 14 shows the percent contribution of each stage of the supply chain to final patient price for two branded generic versions of albendazole 400mg. While the mark-up structures are similar, the final price of one branded generic is double that of the other.

Table 14: Percent contribution of each stage of the supply chain to final patient price, albendazole 400mg chewable tablets

DATA	RURAL		URBAN	
	Mankind	Alkem	Mankind	Alkem
Product type	Branded generic	Branded generic	Branded generic	Branded generic
MSP/CIF contribution	68.54%	69.32%	68.54%	69.32%
Stage 1 contribution	0.00%	0.00%	0.00%	0.00%
Stage 2 contribution (Landed Price)	0.00%	0.00%	0.00%	0.00%
Stage 3 contribution (Wholesaler)	7.68%	7.42%	7.68%	7.47%
Stage 4 contribution (Retailer)	19.03%	18.50%	19.03%	18.45%
Stage 5 contribution (Dispensed Price)	4.76%	4.76%	4.76%	4.76%
Final price	8.99	18.60	8.99	18.60
Scheme (Purchase Qty. + free qty	5+1		9+1	

Figures 15 and 16 show the percent contribution of each stage of the supply chain to final patient price for two suspensions. Figure 15 shows the originator brand and a branded generic version of paracetamol syrup, while figure 16 shows the originator brand version of carbamazepine suspension. No substantial difference in mark-up structure is observed for suspensions in comparison with tablets, injections or inhalers. Similar to other medicines, results do not vary by urban and rural areas.

Figure 15: Percent contribution of each stage of the supply chain to final patient price, paracetamol syrup 125mg/5ml

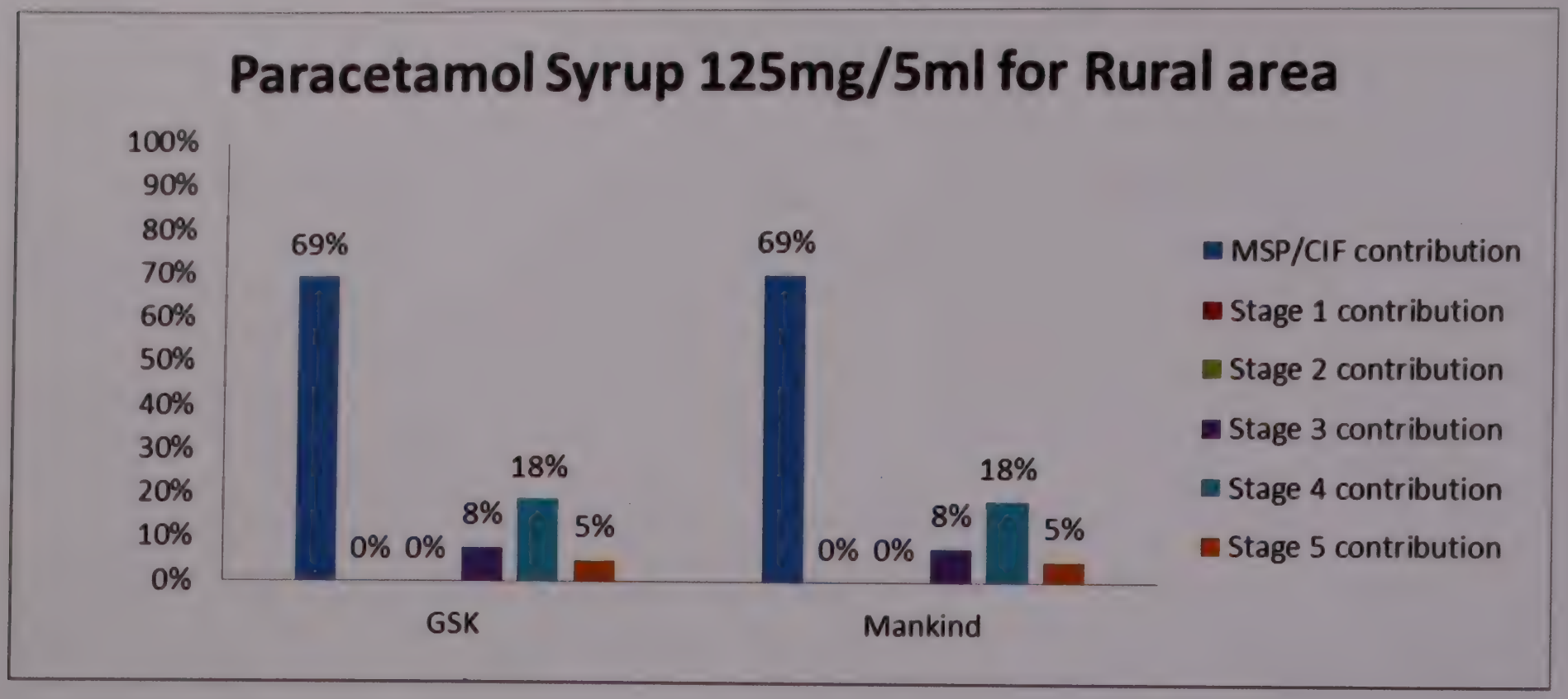
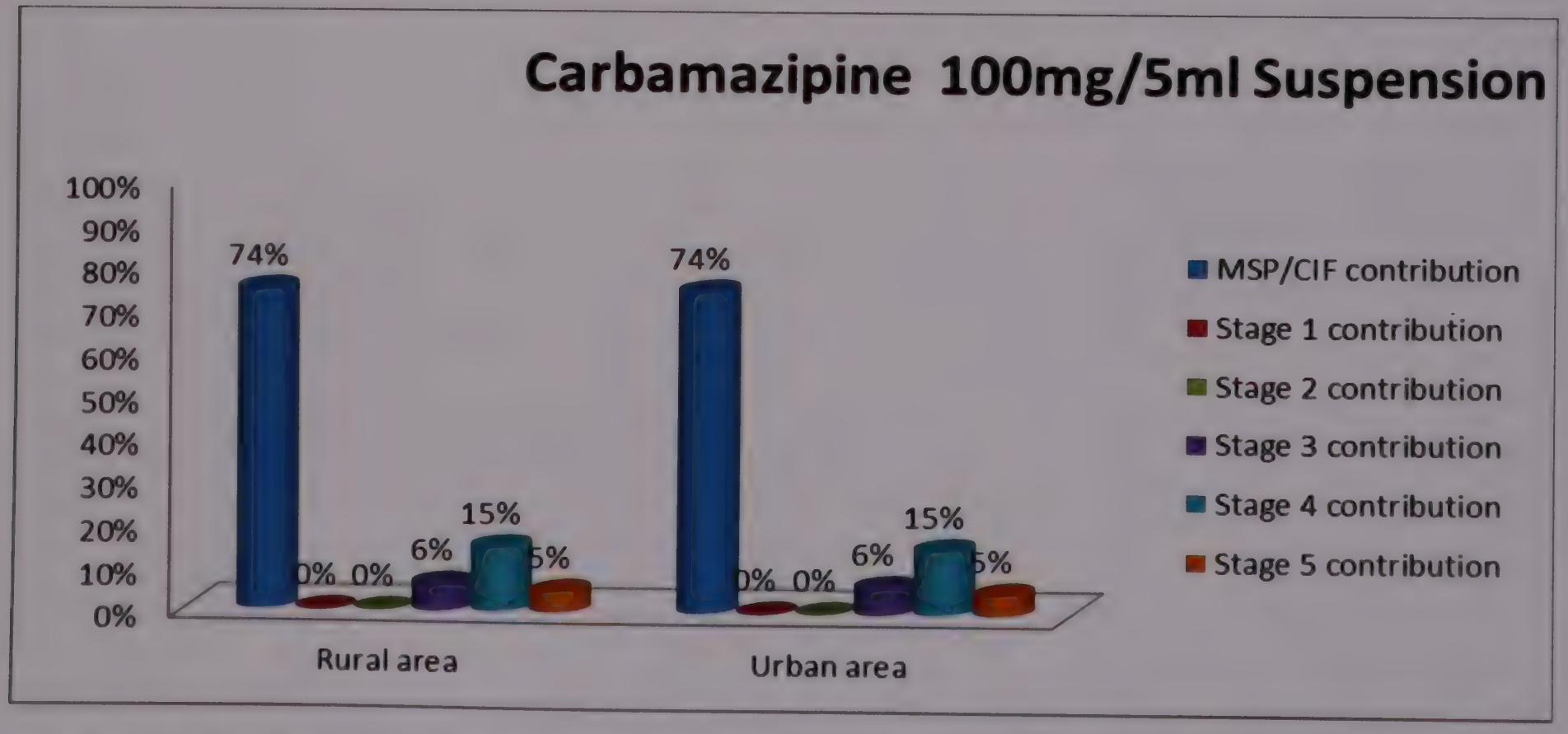


Figure 16: Percent contribution of each stage of the supply chain to final patient price, carbamazepine 100mg/5ml suspension



The results of the price components study show that the determining factor in the magnitude of the supply chain charges, and particularly the retail mark-up, is whether the product is an originator brand/branded generic or an unbranded generic. Retail mark-ups may be higher for unbranded generics due to their lower "base" price (MSP) which provides a greater potential to apply higher mark-ups. Location of the facility (urban/rural) and dosage form (injection, tablet, inhaler or suspension/syrup) do not seem to affect the mark-ups substantially. This is contrary to the hypothesis that syrups would incur higher mark-ups as a result of their higher weight and consequent higher transport costs

Discussion

Drugs offer a simple, cost-effective solution to many health problems, provided they are available, affordable, and properly used[10]. Bernard Pécoul and team feels that the problems of access to quality drugs for the treatment of diseases that predominantly affect the developing world are: (1) poor-quality and counterfeit drugs; (2) lack of availability of essential drugs due to fluctuating production or prohibitive cost or lack of timely action for procurement; (3) lack of field-based drug research to determine optimum utilization and lack of development for new drugs for the developing world. These problems are not independent and unrelated but are a result of the fundamental nature of the pharmaceutical market and the way it is regulated.

Although progress has been made towards achieving an increase in the use and availability of cost effective drugs globally, very few countries have succeeded in decreasing the use of unsafe drugs. As Masuma Mamdani and Godfrey Walker[11] says, "The political will of governments to improve the health situation of their people is the key determinant of success. A rational and strong national drug policy backed by adequate legislation is imperative".

The results of the study show that medicines to treat common childhood illnesses have poor availability in the public and non-profit sectors. In the public sector, more than half of the medicines studies were not available in any of the facilities surveyed. Poor availability was observed for antimalarials, certain antibiotics, antidiarrhoeals (zinc) and antibacterials in the public sector which is the main source of help for the poor. While availability in the private sector is higher, overall it was still less than 50%. As a result of poor availability, children are denied life saving drugs like zinc for diarrhea, and quinine for life threatening cerebral falciparum malaria. Surprisingly ORS had over 80% availability in public and private sectors. Poor availability is more conspicuous with regard to Child Friendly formulations. Whatever medicines are available, they are not in Child friendly formulations like DTs (dispersible tablets) and Syrups. Young infants do not get drops or suppositories. The scenario of inadequate drugs worsens when whatever is available is unaffordable. Private sectors procures medicines and charges patients at very high rates as they do not practice generic prescribing and yield to pressures of aggressive marketing by lead brands.

Fortunately this political will and strong State drug policy is emerging in Chhattisgarh as we can see from the impact of this study. For example, along with this survey two workshops were held on 17th May & 23rd July 2010 to revise the existing EML of 2007 due to renewed interest on rational drug prescribing and use in the state. Revised EML 2010 came into effect on 31st Dec 2010 with inclusion of child friendly formulations. (refer www.cghealth.nic.in)

The evidence and analysis from the survey will be used for improved procurement and logistics. Advocacy for setting up the Chhattisgarh Medical Services Corporation (CGMSC) for this purpose gained momentum. After several meetings, study tours to other states and deliberations CGMSC was formed on 3rd March 2011.

The WHO is focusing on a limited list of 20 priority medicines for children, which are selected based on the evidence available to improve child survival as well as the fact that they are treatment options for the major causes of mortality and morbidity in children under 5 years of age. Medicines for the treatment of pneumonia, diarrhea, malaria, neonatal infections, HIV, tuberculosis, and palliative care as well as vitamin A (for improving child survival) will be the priority medicines which can easily be incorporated into any procurement list, even in resource poor settings.(Gitanjali 2011) If this small number of medicines can be made available at public health facilities throughout the year and used by the health personnel, a significant impact on child morbidity and mortality can be expected.[12] Chhattisgarh has included all and gone beyond this list for procurement by the newly formed Medical Services Corporation.

Recommendations

- There is an urgent need to make child specific essential formulations / drugs available in government outlets.
- A centralised procurement and logistics system for essential medicines for children in Chhattisgarh state is needed. Procurement practices should be transparent and should be monitored by authorities at the highest levels of the department of Health.
- The state should avoid further delays in the procurement of essential drugs and ensure distribution to end users. It should also improve drug warehousing including construction of warehouses as per approved standard design.
- There is an urgent need for training and capacity building on pharmaceutical supply management, including needs assessment, indenting and maintenance of stock at the primary care level as well as at higher levels.
- Along with generic prescribing and procurement, strict quality control and testing of drugs should be ensured. This requires the immediate activation of State Drug testing Laboratory.
- The state EML/EMLc and STGs should be disseminated to all doctors and pharmacists irrespective of whether they are in the government service or not.
- Compliance with rational drug use should be monitored, e.g. through periodic prescription analysis.

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Annex 1. Availability of individual medicines

A. Lowest-Priced Products

Medicine Name	Public sector (n=75)	Private sector (n=60)	Private, for-profit sector (n=21)	Private, non-profit sector (n=4)
Amoxicillin suspension	2.4%	68.3%	14.3%	0.0%
Amoxicillin powder for suspension	36.1%	61.7%	28.6%	25.0%
Amoxicillin dispersible tablet	0.0%	71.7%	28.6%	0.0%
Amoxicillin+clavulanic acid suspension	0.0%	21.7%	14.3%	0.0%
Amoxicillin + calvulanic acid dispersible tab	0.0%	28.3%	28.6%	0.0%
Artemether + Lumefantrine dispersible	0.0%	8.3%	4.8%	0.0%
Artemether + Lumefantrine dry syrup	0.0%	13.3%	9.5%	0.0%
Beclomethasone inhaler	0.0%	1.7%	9.5%	0.0%
Benzylpenicillin injection	26.5%	6.7%	33.3%	25.0%
Carbamazepine suspension	0.0%	26.7%	9.5%	0.0%
Carbamazepine tab - chewable	3.6%	48.3%	33.3%	0.0%
Ceftriaxone injection	0.0%	96.7%	71.4%	25.0%
Co-trimoxazole tablet	89.2%	90.0%	38.1%	0.0%
Co-trimoxazole suspension	81.9%	88.3%	38.1%	25.0%
Diazepam rectal suppository	0.0%	0.0%	0.0%	0.0%
Ferrous salt suspension	0.0%	0.0%	0.0%	0.0%
Ferrous salt drops	0.0%	1.7%	0.0%	0.0%
Gentamicin injection	0.0%	16.7%	19.0%	25.0%
Ibuprofen suspension	0.0%	26.7%	33.3%	0.0%
Isoniazid tab	19.3%	3.3%	9.5%	0.0%
Oral rehydration solution (200ml)	1.2%	83.3%	85.7%	0.0%
Oral rehydration solution (for 1L)	92.8%	86.7%	52.4%	75.0%
Paracetamol suspension	84.3%	95.0%	81.0%	50.0%

Paracetamol drops	0.0%	91.7%	81.0%	0.0%
Paracetamol dispersible tab	0.0%	31.7%	4.8%	0.0%
Paracetamol suppository	0.0%	0.0%	9.5%	25.0%
Phenobarbital injection	0.0%	0.0%	33.3%	0.0%
Phenobarbital syrup/oral liquid	0.0%	10.0%	19.0%	0.0%
Phenytoin suspension	0.0%	15.0%	28.6%	25.0%
Phenytoin tablet – chewable	0.0%	0.0%	0.0%	0.0%
Procaine penicillin injection	28.9%	41.7%	9.5%	25.0%
Salbutamol inhaler	0.0%	76.7%	52.4%	0.0%
Vitamin A	0.0%	45.0%	23.8%	0.0%
Zinc dispersible tablet	28.9%	0.0%	0.0%	0.0%
Chloroquine suspension	1.2%	90.0%	57.1%	25.0%
Chloroquine tablet	89.2%	93.3%	42.9%	50.0%
Quinine suspension	0.0%	61.7%	47.6%	25.0%
Quinine tablet	0.0%	23.3%	4.8%	0.0%
Quinine injection	9.6%	43.3%	52.4%	50.0%
Sulphadoxine+Pyrimethamine suspension	0.0%	68.3%	42.9%	0.0%
Sulphadoxine+Pyrimethamine tab	3.6%	85.0%	38.1%	25.0%
Albendazole suspension	37.3%	95.0%	76.2%	75.0%
Albendazole tablet - chewable	85.5%	83.3%	81.0%	100.0%
Promethazine syrup	0.0%	46.7%	52.4%	25.0%
Azithromycin tablet	0.0%	28.3%	23.8%	0.0%
Azithromycin syrup	0.0%	68.3%	71.4%	25.0%
Folic acid tab	20.5%	81.7%	90.5%	50.0%
Prednisolone tablet	49.4%	85.0%	81.0%	75.0%
Salmeterol+Fluiticasone inhaler	0.0%	5.0%	19.0%	0.0%
Metronidazole suspension	54.2%	60.0%	61.9%	0.0%

B. Highest-priced Products

Medicine Name	Public sector (n=75)	Private sector (n=60)	Private, for-profit sector (n=21)	Private, non-profit sector (n=4)
Amoxicillin suspension	0.0%	16.7%	0.0%	0.0%
Amoxicillin powder for suspension	0.0%	10.0%	0.0%	0.0%
Amoxicillin dispersible tablet	0.0%	21.7%	0.0%	0.0%
Amoxicillin+clavulanic acid suspension	0.0%	3.3%	0.0%	0.0%
Amoxicillin + calvulanic acid dispersible tab	0.0%	10.0%	9.5%	0.0%
Artemether + Lumefantrine dispersible	0.0%	0.0%	0.0%	0.0%
Artemether + Lumefantrine dry syrup	0.0%	0.0%	4.8%	0.0%
Beclomethasone inhaler	0.0%	0.0%	0.0%	0.0%
Benzylpenicillin injection	0.0%	0.0%	0.0%	0.0%
Carbamazepine suspension	0.0%	0.0%	0.0%	0.0%
Carbamazepine tab - chewable	0.0%	1.7%	0.0%	0.0%
Ceftriaxone injection	0.0%	46.7%	28.6%	0.0%
Co-trimoxazole tablet	0.0%	1.7%	0.0%	0.0%
Co-trimoxazole suspension	0.0%	8.3%	4.8%	0.0%
Diazepam rectal suppository	0.0%	0.0%	0.0%	0.0%
Ferrous salt suspension	0.0%	0.0%	0.0%	0.0%
Ferrous salt drops	0.0%	0.0%	0.0%	0.0%
Gentamicin injection	0.0%	0.0%	0.0%	0.0%
Ibuprofen suspension	0.0%	6.7%	14.3%	0.0%
Isoniazid tab	0.0%	0.0%	0.0%	0.0%
Oral rehydration solution (200ml)	0.0%	48.3%	38.1%	0.0%
Oral rehydration solution (for 1L)	0.0%	36.7%	4.8%	0.0%
Paracetamol suspension	0.0%	63.3%	47.6%	0.0%
Paracetamol drops	0.0%	65.0%	33.3%	0.0%

Paracetamol dispersible tab	0.0%	1.7%	4.8%	0.0%
Paracetamol suppository	0.0%	0.0%	0.0%	0.0%
Phenobarbital injection	0.0%	0.0%	0.0%	0.0%
Phenobarbital syrup/oral liquid	0.0%	0.0%	0.0%	0.0%
Phenytoin suspension	0.0%	0.0%	0.0%	0.0%
Phenytoin tablet - chewable	0.0%	0.0%	0.0%	0.0%
Procaine penicillin injection	0.0%	0.0%	0.0%	0.0%
Salbutamol inhaler	0.0%	1.7%	0.0%	0.0%
Vitamin A	0.0%	0.0%	0.0%	0.0%
Zinc dispersible tablet	0.0%	0.0%	0.0%	0.0%
Chloroquine suspension	0.0%	25.0%	9.5%	0.0%
Chloroquine tablet	0.0%	20.0%	0.0%	0.0%
Quinine suspension	0.0%	16.7%	0.0%	0.0%
Quinine tablet	0.0%	6.7%	0.0%	0.0%
Quinine injection	0.0%	13.3%	4.8%	0.0%
Sulphadoxine+Pyrimethamine suspension	0.0%	11.7%	9.5%	0.0%
Sulphadoxine+Pyrimethamine tab	0.0%	35.0%	9.5%	0.0%
Albendazole suspension	0.0%	48.3%	28.6%	0.0%
Albendazole tablet - chewable	0.0%	33.3%	28.6%	25.0%
Promethazine syrup	0.0%	13.3%	4.8%	0.0%
Azithromycin tablet	0.0%	8.3%	4.8%	0.0%
Azithromycin syrup	0.0%	38.3%	38.1%	0.0%
Folic acid tab	0.0%	21.7%	23.8%	0.0%
Prednisolone tablet	0.0%	46.7%	14.3%	0.0%
Salmeterol+Fluiticasone inhaler	0.0%	0.0%	0.0%	0.0%
Metronidazole suspension	0.0%	8.3%	4.8%	0.0%

Annex 2. Ratio of government procurement prices to MSH international reference prices (median price ratio, MPR)*

Medicine Name	Median price ratio (MPR)
Amoxicillin powder for suspension	0.82
Benzylpenicillin injection	1.19
Carbamazepine tab – chewable	0.18
Co-trimoxazole tablet	1.08
Co-trimoxazole suspension	0.76
Oral rehydration solution (for 1L)	0.96
Paracetamol suspension	0.62
Quinine injection	0.98
Albendazole tablet – chewable	0.96
Promethazine syrup	0.71
Folic acid tab	1.07
Prednisolone tablet	0.99
Metronidazole suspension	0.46

*Some medicines are not included as there was insufficient price data to allow calculation of MPR.

Annex 3. Ratio of median patient prices to MSH international reference prices (median price ratio, MPR)*

A. Highest-Priced Products

Medicine Name	Public sector (n=75)	Private sector (n=60)	Private, for-profit sector (n=21)	Private, non-profit sector (n=4)
Amoxicillin suspension		4.57		
Amoxicillin powder for suspension		4.12		
Amoxicillin dispersible tablet		5.91		
Amoxicillin + calvulanic acid dispersible tab		1.45		
Ceftriaxone injection		1.69	1.81	
Co-trimoxazole suspension		1.27		
Ibuprofen suspension		1.11		
Oral rehydration solution (for 1L)		4.12		
Paracetamol suspension		2.70	2.70	
Paracetamol drops		1.95	1.95	
Chloroquine suspension		0.68		
Chloroquine tablet		1.17		
Quinine injection		2.96		
Sulphadoxine+Pyrimethamine suspension		0.37		
Sulphadoxine+Pyrimethamine tab		1.82		
Albendazole suspension		2.46	2.49	
Albendazole tablet - chewable		19.74	20.42	
Promethazine syrup		1.57		
Folic acid tab		20.88	20.88	
Prednisolone tablet		1.66		
Metronidazole suspension		0.99		

B. lowest-Priced products

Medicine Name	Public sector (n=75)	Private sector (n=60)	Private, for-profit sector (n=21)	Private, non-profit sector (n=4)
Amoxicillin suspension		4.10		
Amoxicillin powder for suspension		3.81	3.72	
Amoxicillin dispersible tablet		5.73	5.83	
Amoxicillin+clavulanic acid suspension		1.48		
Amoxicillin + calvulanic acid dispersible tab		1.00	1.46	
Artemether + Lumefantrine dispersible		1.64		
Benzylpenicillin injection		1.85	1.85	
Carbamazepine suspension		0.12		
Carbamazepine tab - chewable		0.23	0.23	
Ceftriaxone injection		1.68	1.69	
Co-trimoxazole tablet		1.36	1.36	
Co-trimoxazole suspension		1.27	1.27	
Gentamicin injection		1.03	1.03	
Ibuprofen suspension		1.11	1.11	
Oral rehydration solution (for 1L)		3.91	4.12	
Paracetamol suspension		2.39	2.57	
Paracetamol drops		1.78	1.83	
Phenobarbital injection			2.14	
Salbutamol inhaler		1.17	1.17	
Vitamin A		0.13	0.13	
Chloroquine suspension		0.68	0.68	
Chloroquine tablet		1.17	1.17	
Quinine injection		2.80	2.82	
Sulphadoxine+Pyrimethamine suspension		0.36	0.36	
Sulphadoxine+Pyrimethamine tab		1.77	1.77	
Albendazole suspension		1.28	1.60	
Albendazole tablet - chewable		10.14	13.48	9.33
Promethazine syrup		1.35	1.35	
Folic acid tab		20.88	20.88	
Prednisolone tablet		1.39	1.41	
Metronidazole suspension		1.27	0.96	

State Health Resource Centre,
Raipur, Chhattisgarh

World Health Organization,
New Delhi